ISSN #1941-7519 (printed)
#1941-7527 (online)

Opuscula Philolichenum

Published: 7.December.2009
VOLUME 7

Published by J.C. Lendemer
Bronx, New York, U.S.A.

Opuscula Philolichenum

small works in the field of lichenology

****

Opuscula Philolichenum is intended to serve as a venue for the publication of small works in the field of lichenology (including lichenicolous fungi and non-lichenized fungi traditionally treated with lichens). The journal is primarily electronic, available on-line free of charge (at http://sweetgum.nybg.org/philolichenum/), with a limited print run to satisfy the requirements for effective publication established under the *International Code for Botanical Nomenclature*.

The central goal of the journal is to provide timely publication, in a professional format, free of charge to authors and readers. While the journal focuses on topics relating to the lichen biota of North America this is by no means exclusive and manuscripts on other topics will be considered as the table of contents of the present issue clearly illustrates.

Authors wishing to submit a manuscript for publication in *Opuscula Philolichenum* should contact the editor prior to submission to confirm that the paper conforms to the mission of the journal (outlined above). Manuscript submissions ***should be left unformatted*** and authors should consult a recent issue of *Opuscula Philolichenum* for style. All submissions are subjected to review by at least two peer reviewers and, following acceptance are formatted by the editor.

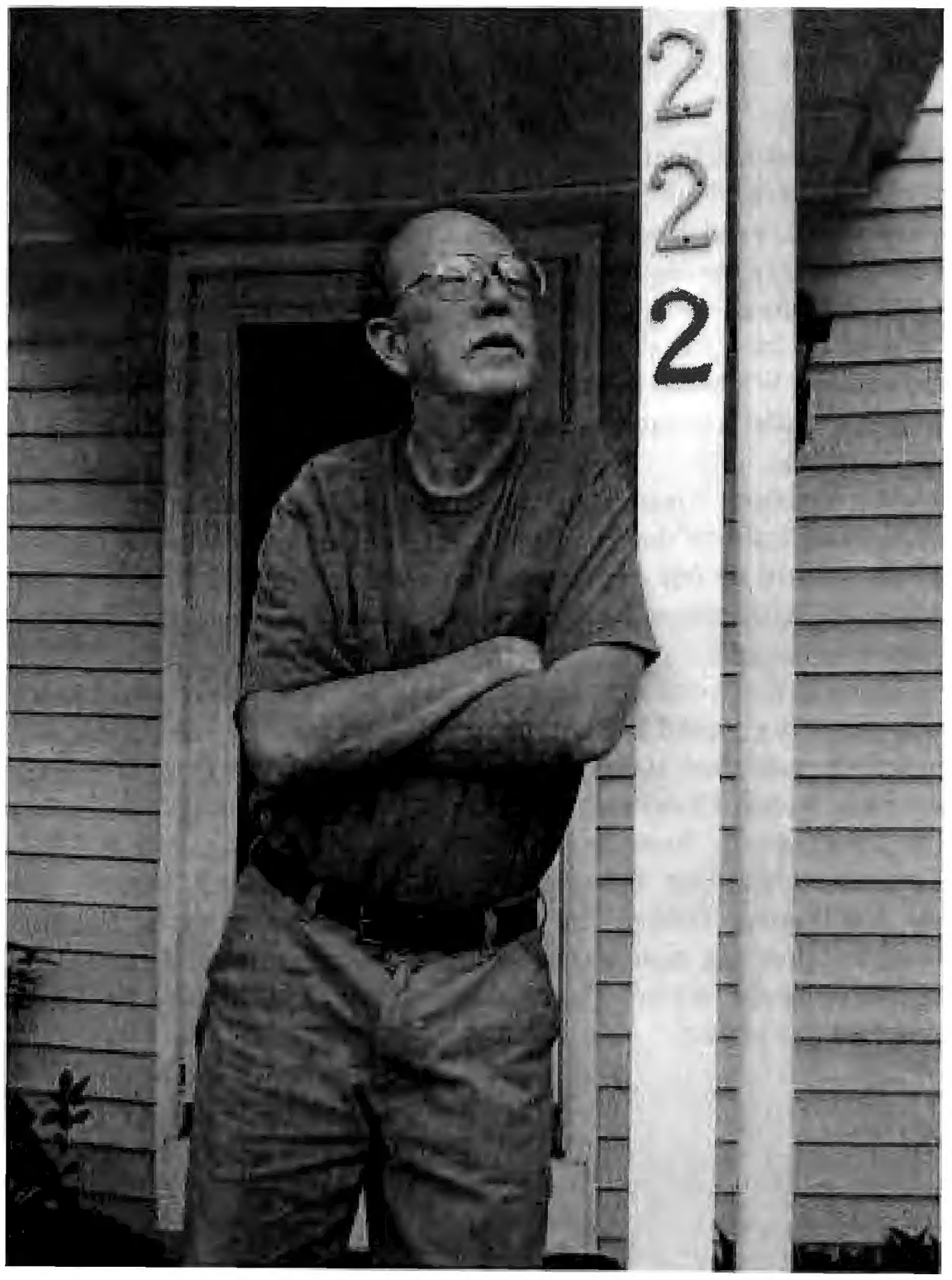
As has been noted in the preface to previous issues the backbone of any scientific journal is its cohort of reviewers. As such the editor would like to take this opportunity to thank those who graciously provided peer review of manuscripts published in this volume: Mikhail Andreev, Othmar Breuss, Irwin Brodo, Robert Cameroon, Paul Diederich, Robert Dirig, Jack Elix, Javier Etayo, Jim Hinds, Mireia Giralt, M. Gohkan Halici, Richard Harris, David Hawksworth, Brendan Hodkinson, Robert Lücking, Patrick McCarthy, Bruce McCune, Matthew Nelsen, Dag Øvstedal, Alan Orange, Christian Printzen, Rick Seavey, Harrie Sipman, Laurens Sparrius, Göran Thor, and Dagmar Triebel. The editor also extends his sincerest thanks to the associate editors whose efforts in editing and proofing manuscripts, soliciting manuscripts, and corresponding with authors have greatly improved the quality of the journal. Thanks also to Brendan Hodkinson and Melissa Tulig for their help with the online presence of this journal.

Forward

As regular readers of this journal will likely notice, the present issue of *Opuscula Philolichenum* has arrived in print several months earlier than usual. The reason for this is the need to acknowledge the 70th birthday of Richard "Dick" Harris, the resident lichenologist at The New York Botanical Garden who has been a leading figure in our field for more than four decades. Dick played a pivotal role in the creation of *Opuscula Philolichenum* and has been both a reliable contributor and reviewer over the years. Considering his support of this endeavor as well as his strong belief in the value of autonomous publication and digital media the dedication of a special issue to him would seem to be a fitting tribute. (Those who know him would also likely agree that this is also the only appropriate tribute.)

Knowing that Dick is not one to mince words, I have decided to keep this introduction concise and to the point. Lichenologists, especially those of us working in North America, owe a lot to Richard Harris though we might not always be fully aware of it. The long lasting impact he has had on our field can be seen not only in the form of publications and nomenclatural novelties (there is no shortage of these) but also in the number of us whom he has guided, influenced, or otherwise somehow inspired to study lichens. The contributors to the present issue all fall into this category in some way; whether working from his collections, using his publications, or being guided as his students, we all owe something to Dick. With that said we wish him a happy 70th birthday and dedicate this issue of *Opuscula Philolichenum* to him.

J.C. Lendemer, Editor.



Richard Harris, 2009 (photo by Joy Runyon).

Table of Contents

Front Matter

i-vi.

Buck, W.R.

Biographical sketch: Richard Clinton Harris, the quintessential North American lichenologist.

vii-xxvi.

Brodo, I.M.

Calvitimela talayana (Ascomycotina, Lecanorales), an interesting disjunction in North America.

1-6.

Grube, M. and J.C. Lendemer

Arthonia rubrocincta: belated validation of a name for a common species endemic to *Sabal palmetto* in the southeastern United States.

7-12.

Lendemer, J.C. and O. Breuss

Verrucaria thujae (Verrucariaceae, Lichenized Ascomycetes), a new corticolous species from the Great Lakes Region of North America.

13-16.

Etayo, J. and F. Berger

Carnegieispora rimeliae, a new genus of lichenicolous fungus from the Azores.

17-20.

Knudsen, K. and J.C. Lendemer

Two new species of *Lecanora* with gyrophoric acid from North America.

21-28.

Knudsen, K. and J. Kocourková

Lichens, Lichenicolous and Allied Fungi of the Santa Monica Mountains, Part 4: Additions and Corrections to the Annotated Checklist.

29-48.

Seavey, F.

Cryptothecia evergladensis sp. nov. (Arthoniaceae), a new lichen species from Everglades National Park, Florida.

49-54.

Sipman, H.

The lichen genus *Syncesia* (Arthoniales) on Saba and St. Eustatius (West Indies).

55-60.

Knudsen, K. and J. Etayo

Sarcogyne algerica H. Magn., New to Europe.

61-64.

Bennett, J.P. and C.M. Wetmore

Changes in Macrolichens of Douglas County, Wisconsin.

65-70.

McMullin, R.T.

Lichens of Kejimkujik National Park and National Historic Site, Nova Scotia, Canada (Provisional List)

71-78.

Lendemer, J.C. and B.P. Hodkinson

The Wisdom of Fools: new molecular and morphological insights into the North American apodetiate species of *Cladonia*.

79-100.

Ladd, D.

Lichens and Related Fungi of Pine Bluff Arsenal, Arkansas.

101-120.

Zhurbenko, M.P.

Lichenicolous fungi and lichens from the Holarctic. II.

121-186.

McCarthy, P.M. and A.M. Fryday

A new saxicolous species of *Porina* (Ostropales; Porinaceae) from the Falkland Islands.

187-190.

Lendemer, J.C. and K. Knudsen

Further notes on the genus *Ramonia* in California: the first modern record of *R. ablephora* and the description of *R. extensa* sp. nov.

191-194.

Index to New Taxa

195.

Opuscula Philolichenum, **7**: vii-xxvi. 2009.

Biographical sketch: Richard Clinton Harris, the quintessential North American lichenologist

WILLIAM R. BUCK [1]

Richard (Dick) Clinton Harris was born on 6 December 1939, at 7:17 a.m., at St. Joseph's Mercy Hospital in Ann Arbor, Michigan. He was the first child of Clinton Howe Harris and Esther Marion Dilman (Harris). His father worked for Argus Cameras (now defunct) and his mother was a housewife. When Dick was two years old, his sister Patricia Sue Harris was born on 18 January 1942. The two were very close as Dick grew up, and Dick even provided Pat's middle name. A third sibling, Alan Leslie Harris, was born on 22 July 1947.

Many of Dick's interests—particularly reading and gardening—seemed to have developed early. His mother recorded that Dick's favorite toys at both 18 months and two years old were books, prescient indeed of an early indication of what would become a lifelong bibliophilia. Similarly, Dick's strong interest in vegetable and flower gardening developed in early childhood, perhaps a result of many visits to his maternal grandparents' farm in Cass, in the Thumb of Michigan. His sister, Pat, recalls the two of them (Alan was considerably younger) at the Dilman farm playing in the hay loft. The farm was so remote that rural electrification and indoor plumbing only arrived in the 1950s.

Dick attended Angell Elementary School in Ann Arbor (Fig. 1), and then grades seven through nine at Tappan Junior High School. He attended the only public high school in town at the time, Ann Arbor High School (now Ann Arbor Pioneer High School), and graduated in 1957 at age 17 (Fig. 2). During high school Dick worked at the Ann Arbor Public Library, the perfect place to indulge his love of books. It was around this time that his family moved down the block to the former home of an Italian count, where Dick and his mother lovingly restored the gardens together. Dick's room was the former maid's quarters, with its own exterior entrance and bathroom. His brother, Alan, remembers it this way:

> Another result of the house projects was some gainful 'employment' for Dick to earn spending money. As one example, the house had large formal grounds initially in very poor condition, including a large number of graveled paths. I remember one summer that Dick took on the job of cleaning out all the paths and putting down new crushed stone. He single-handedly carried tons of stone, barrow load by barrow load, from a huge pile dumped in our driveway and spread it with shovel and rake. (I was very impressed, as up to that time I had viewed my brother as more of an intellectual than a perspiring, red-in-the-face physical laborer!)

Growing up in Ann Arbor, it wouldn't have been surprising for Dick to attend the hometown University of Michigan, but instead he opted for Oberlin College in Ohio. He entered as a classics major, but although he enjoyed studying Latin and Greek, the department was a poor fit for him and he turned instead to the study of botany. He relates how on an early field trip with Oberlin professor George Tallmon Jones (1897–1998) he chanced upon a pigment-deficient form of *Cladonia cristatella* (British soldiers) with yellow, rather than the typical red, apothecia. He asked everyone around if they knew anything about this and no one did. This ignited his lifelong interest in lichens. In college Dick also became interested in musical theater and summers he traveled to Cape Cod to construct sets for performances of Gilbert and Sullivan musicals. Dick graduated from Oberlin College in 1962 with his botany degree in hand. Before beginning graduate school, though, Dick moved back to his parents' home in Ann Arbor and worked in the chemistry library at the University of Michigan. During this period, his sister Pat got married, and Dick decorated her wedding cake (Fig. 3).

[1]WILLIAM R. BUCK – Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY 10458-5126, U.S.A. – e-mail: bbuck@nybg.org

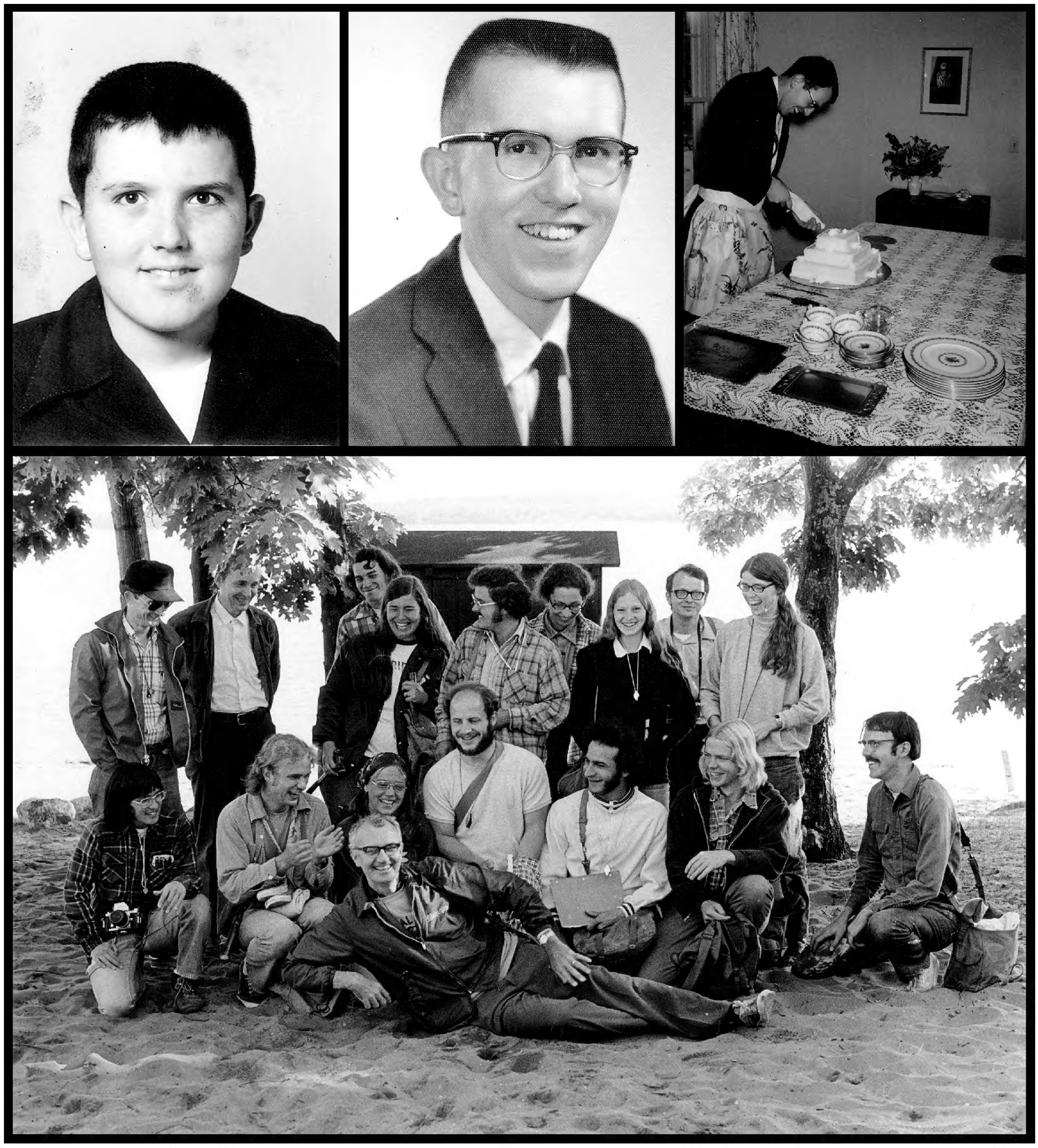


Figure 1 (top left), Dick Harris in elementary school (photograph courtesy of Pat Harris). Figure 2 (top center), Dick Harris' high school graduation photograph, 1957 (photograph courtesy of Pat Harris). Figure 3 (top right), Dick Harris decorating his sister's wedding cake, 1963 (photograph courtesy of Pat Harris). Figure 4 (bottom), lichen class at the University of Michigan Biological Station, 1974 (Dick Harris at far right; back row at left, Jerry Snider and Mason Hale; Bill Buck below Mason Hale).

Figure 5, 1969 Campbell Island expedition. Dale Vitt is second from left, Rudy Schuster is far right and Dick is second from right (photograph courtesy of Dale Vitt).

Dick began graduate school at Michigan State University in 1964, to work on lichens with Henry Andrew Imshaug (b. 1925). Shortly after arriving in Lansing, Dick and Imshaug sat down to decide upon a topic for Dick's master's thesis. Imshaug suggested the pyrenolichens and, after a short consideration of the topic, it became Dick's area of lichen specialization for the next 45 years and beyond. In late 1966 he turned in his master's thesis, "A survey of the corticolous pyrenocarpous lichens of the Great Lakes region." It would be more than six years before he published it and validated the new nomenclature, but in that interval he almost doubled the number of species treated, and solved a number of taxonomic problems that had been left open in the thesis.

At about this same time, Dick began his long affiliation with the University of Michigan Biological Station. In 1967 he assisted Howard Alvin Crum (1922–2002) in teaching the lichenology course at the station. In the summer of 1974 I met Dick and before the summer was over a romance developed. I had just finished my first year in graduate school at the University of Michigan and attended UMBS to take courses in bryology and lichenology, both with Crum, and boreal flora with Edward Groesbeck Voss (b. 1929). Dick was the teaching assistant in the lichen course, and Mason Ellsworth Hale, Jr. (1928–1990) visited that summer (Fig. 4). Starting that summer and working in subsequent years, Dick wrote a set of keys to the lichens of the Straits region of Michigan, among the first keys to crustose species in North America. These keys underwent several revisions, until Dick left Michigan in 1979. The first version came out in 1976, but was of limited distribution. However, a revised version was ready for the summer of 1977, and that edition is widely circulated. During that summer the American Institute of Biological Sciences met at Michigan State University and Dick and I organized the field trip for the American Bryological and Lichenological Society at UMBS. Dick's keys were distributed to the many international lichenologists that attended. They were there because shortly following the AIBS meeting there was an international mycological congress in Florida and Mason Hale had organized a collecting trip down the Appalachians for them.

Dick began work on his doctoral dissertation shortly after turning in his master's thesis in 1966; he would not complete it until 1975. The dissertation topic itself was difficult (revision of *Arthopyrenium* s.l. in North America), but what really held up progress were wonderful opportunities for fieldwork. Dick's advisor, Henry Imshaug, was very interested in sub-Antarctic lichens and received significant National Science Foundation funding for fieldwork in the region. Dick took part in three lichen-collecting trips.

Figure 6, Dick Harris curating the University of Michigan Lichen Herbarium, ca. 1977.

On the first, from mid-December 1967 to mid-February 1968, Dick and fellow graduate student John Jay Engel (b. 1941) accompanied Imshaug on a collecting trip to the Falkland Islands. My favorite story from that trip is about the group being served fried penguin eggs: with their bright red yolks and completely translucent albumen the eggs resembled large, bloodshot eyes, and the flavor was decidedly fishy.

In late 1969, Dick, Imshaug, University of Michigan graduate student Dale Hadley Vitt (b. 1944), and well-known hepaticologist Rudolf Mathias Schuster (b. 1921) went to Campbell Island (Fig. 5), arriving on 22 December 1969 and leaving on 23 January 1970. Short trips by just the lichenologists to the Antipodes Islands and Snares Islands would follow in February 1970. Dale Vitt recalls his clearest memory of the Campbell Island trip. Each day the group would go out on treks through the scrub. On one of the longest of these treks, from one end of the island to the other, the group was returning after a long day in the field and hiking along a ridge top. Dick was directly in front of Dale and Dale was mainly looking at the ground for mosses. Dale recalls tripping and accidentally pushing Dick into a large mud hole, and his thoroughly mud-caked companion glaring angrily up at him. He is sure that Dick still hates him from that event!

The following year, 1971, Dick, Imshaug and Engel went to Kerguelen Island, a French territory in the South Indian Ocean. They traveled by French freighter. Dick recalls the continual supply of wine on the island, delivered by the freighter, and playing cards with the French soldiers stationed there. To this day, Kerguelen remains remote and difficult to access.

In November 1974 Dick moved from Lansing, Michigan, to Ann Arbor, where he had a job curating the University of Michigan lichen collection. It was at that point that Dick and I moved in together, and it is that date, 14 November, that we recognize as the anniversary of our relationship. During that time Dick worked on finishing his dissertation, which I helped type (in pre-computer days).

Also, during that period, Dick completely rearranged the MICH lichen collection (Fig. 6), the strength of which is the inclusion of the lichen collection of Bruce Fink (1861–1927). Younger botanists may not know of, and older botanists may have chosen to forget, the distinctive odor of herbaria back in those days. MICH used naphthalene crystals (moth balls) in the collection. It came in huge 55 gallon containers and was literally shoveled into the cabinets. It was particularly abundant in the fungal collection (immediately adjacent to the lichens), to discourage mushroom-eating insects. However, the herbarium was not centrally heated or cooled, and on warm days

the greenhouse effect through the old windows caused the crystals inside the cases to sublimate, and in the evening, when the cases cooled off, the naphthalene would recrystalize on the doors of the cases, forming large stalactites. You couldn't work in the collection without all your clothes smelling of the chemicals. Ah, the good old days! The Director of the Herbarium at the time, Rogers McVaugh (1909–2009), used to say that you wouldn't need to embalm him because of the pervasiveness of the naphthalene!

In January 1979 I moved to New York to take the position of Associate Curator of Bryophytes at The New York Botanical Garden. I was scheduled to leave for a Projeto Flora Amazônica expedition shortly after my arrival and the trip was scheduled to last for three months. Dick remained in Ann Arbor (and then later moved to his sister's house in Jackson, MI) until we could move him to New York. Upon my return to the States, Dick and I packed up his belongings and moved him to the Bronx.

It was at this point, in mid-1979, that Dick began his association with The New York Botanical Garden. Although never on the regular staff, Dick has been accepted as a staff member since his earliest days and has worked on grant money on several occasions. When Dick started at NYBG, there had never been a resident lichenologist, and the collection was poorly curated. In 1979 the NY lichen collection numbered about 60,000 specimens, made by various staff (most notably the Brittons) and received on exchange. In the intervening 30 years, the collection has grown to about 195,000 specimens, making it one of the largest in North America. Most of these collections were either gathered or identified by Dick. Additionally, the lichens have become the best curated part of the NYBG Herbarium because of Dick's diligence (Fig. 7). He has put great effort into making eastern North America and tropical America the strengths of the NY lichen herbarium.

In 1998 Dick and I were finally able to afford a house and move out of the Bronx. After close to 20 years in the Bronx together, we were ready for a different life style. We bought a house 50 miles north of the Bronx, in Putnam County, New York, with over an acre of land. We had had a small vegetable garden while living together in Ann Arbor, but it was a poor substitute for someone who loves gardening as much as Dick does. Almost overnight we changed from active urbanites, who regularly attended plays and visited museums, to rural folk, anxiously anticipating arrival of the next seed catalog. After over 11 years in the house, the amount of grassy lawn is decidedly less and vegetable and flower beds cover the property, along with a small fruit orchard. We have planted interesting trees and shrubs in the front yard, diminishing the grass still further, and making mowing more difficult. We grow most of the vegetables we eat during the warmer months, and put aside as much of the bounty as we can for the other months. Dick refers to himself as a "facultative" vegetarian because I do all the cooking and only cook vegetarian. Dick truly loves the time he spends gardening and he looks forward to doing it on a full-time basis.

Dick has long had a true love of fieldwork. As a graduate student he went on extensive collecting trips, usually by himself, and typically camped out of the back of his modified blue Ford pickup truck. His thesis research took him throughout the eastern United States, but with a special emphasis on Florida because of all the tropical lichen elements that make it into the U.S. there. Without doubt, his strongest interest is eastern North America. He used to say that he wasn't interested in a lichen if it was from west of the Mississippi River, but now he's extended that to the edge of the Great Plains. In the mid-1980s Dick and I began to systematically collect lichens in Florida. We would go down almost every year (until 1998), usually between Thanksgiving (3rd Thursday of November) and Christmas, when tourists and mosquitoes were few and temperatures comfortable. We tried to hit every county in the state, and only missed the ones in the southeasternmost part of the state (Miami metropolitan area and the Florida Keys) before other fieldwork distracted us.

Just as Dick's extensive collecting in Michigan allowed him to self-publish his Straits keys, these numerous trips throughout Florida resulted in *Some Florida Lichens*, which he self-published in 1990 in anticipation of the American Bryological and Lichenological Society meeting at Wakulla Springs, Florida, in late December of that year. The sequel, *More Florida Lichens Including the 10¢ Tour of the Pyrenolichens*, was self-published in December 1995, in time for the 3rd Tuckerman Workshop, held in Gainesville, Florida. In this update of the 1990 work, Dick also used the opportunity to present his ideas on the systematics and classification of the pyrenolichens. He primarily focused on the corticolous species of eastern North America, but for favorite groups he broadened his treatments. Unfortunately, other interests intervened and a final treatment of Florida lichens was never forthcoming. Nevertheless, we still enjoy the occasional trip to Florida, usually in association with Thanksgiving, and long for our regular visits. The thousands of lichen collections made in those years will be invaluable for future Florida floristics.

In the late-1990s Dick began his work on the lichens of the Ozark Highlands, in association with Doug Ladd (b. 1953) of The Nature Conservancy. After several field trips and the consequent realization that the Ozarks are rich in lichen endemics, Dick and Doug applied to the National Science Foundation for money to write a treatment of the lichens of the region. They were granted money for three years and during that period there were field trips to the Ozarks every spring and fall. We tried to hit every Ozark county in Missouri and Arkansas, and the Ozarkian corners of Oklahoma, Illinois and Kansas. Every trip would result in a harvest of new taxa and Dick would

Figure 7 (top left), Dick Harris sorting lichens at The New York Botanical Garden, 1998. Figure 8 (bottom), Dick Harris on mule ascending Pico Duarte, Dominican Republic, 1987. Figure 9 (top right), Dick Harris collecting lichens in central French Guiana, 1994 (photograph courtesy of Carol Gracie).

complain (well, he still does) that truly every lichen genus in the Ozarks had problems. Indeed, a preliminary website documents this: http://www.nybg.org/bsci/lichens/ozarks/undescribed.html. Dick's dedication to lichenology is evidenced by his decision to put the grant money into microscope and computer equipment that would allow him to illustrate his new species, rather than into salary for himself. Dick and Doug are still slowly making progress with this treatment of Ozark lichens, with Dick mostly dealing with the crustose species and Doug mainly treating the macrolichens.

Although Dick had extensive field experience in North America and the sub-Antarctic, he had never been in the tropics before coming to The New York Botanical Garden. Shortly after his arrival at the Garden, I received an NSF grant for my work on West Indian mosses, which included extensive fieldwork. Dick joined a number of my bryological field trips to the West Indies and gained valuable firsthand experience with lichens that he had studied from herbarium material for years. Our first trip was to Cuba in 1982. Outside of a strict exchange of scientists with the Smithsonian Institution (where Cubans paid the cost of SI scientists while in Cuba and the Smithsonian paid the costs of Cubans while in the U.S.), during the Castro era we were the first American botanists allowed on the island paying our own way. In future years we had repeated trips to the Dominican Republic, which became one of our favorite field sites (Fig. 8). In 1983 Dick finally got to see mainland tropical America. We spent our Christmas vacation of that year in Ecuador, hosted by Henrik Balslev (b. 1951), and collected in a number of higher elevation sites.

In September of 1994 Dick got to experience lowland South America when we went to central French Guiana on money from the National Geographic Society to inventory cryptogams. This was Dick's first taste of real tropical fieldwork: sleeping in hammocks and bathing in streams. As a result of this fieldwork he understood that the apparent disjuncts of lichens between southern Brazil and the Caribbean or Florida were an artifact of collecting and that many of these "disjunct" lichens were present in the intervening tropics, but restricted to the forest canopy (Fig. 9). Because of the rough fieldwork, Dick insisted on a little luxury after French Guiana, and so we stopped in St. Martin on the way home, staying in luxurious accommodations right on the beach and enjoying French restaurants at each lunch and dinner.

Only a week after getting home from French Guiana and St. Martin, we were off again, this time to Argentina to attend the Latin American Botanical Congress, held that year in Mar del Plata. After the conference, we went on an organized field trip to northwestern Argentina (Tucumán, Salta and Jujuy), accompanied by the Garden's mycologist, Sabine M. Huhndorf (b. 1958). After the Argentine field trip, the three of us flew to São Paulo, Brazil for more fieldwork. Here we hooked up with bryologists Daniel Moreira Vital (b. 1924) and Sandra Regina Visnadi (b. 1965). We rented a car with driver and spent two weeks driving up through Minas Gerais, to Pico das Almas in Bahia, and back to São Paulo. One of the highlights for Dick was a visit to Parque Natural do Caraça, where Edvard August Vainio (1853–1929) had visited and from where he described many new lichen species. For Dick, an added bonus of this Brazilian trip was that it provided a convenient excuse not to attend the International Association of Lichenologists/Grupo Latino-Americano de Liquenólogos meeting in 1997, which also visited Caraça.

In early spring of 1993 Dick and I were getting cabin fever after a long winter in the Bronx. We rented a car and drove up to the Catskill Mountains of New York. We stayed in a very nice inn within close distance to a number of hiking trails. While on this spring get-away, Dick came up with the idea of lichen workshops. His idea was that academia was neglecting organismic biology in general, but especially lichenology. So, he wanted to offer workshops to amateur lichenologists in an attempt to pass on his field and laboratory knowledge to them so that when academia would once again value basic biodiversity knowledge, the information wouldn't have to be generated from scratch. This exact scenario had played out several times in American lichenology, when one generation after another would have to start at the very beginning because of the lack of continuity in lichenology at universities and museums in this country. Thus began the Tuckerman Workshops. In the spring of 1994 we returned to the Catskills with about a dozen invited participants. Each subsequent year we would have another workshop, sometimes more than one, and all over eastern North America. We have met from Florida to Newfoundland and west to Wisconsin and Arkansas (Figs. 10, 11). In the intervening years, the number of participants has grown from a handful to more than 50, undoubtedly due to Dick's influence. In fact, in 2001 Dick received the Peter Raven Award, given by the American Society of Plant Taxonomists to a plant systematist who has made exceptional efforts at outreach to non-scientists. Dick was the second recipient of this award, after Peter Raven himself. Unquestionably, the progress of many of the long-time workshop participants has been a source of pride for Dick, and many of these "amateurs" credit Dick with their lichenological progress.

Dick has been similarly generous with his time and knowledge throughout his career. As one example, Dick gave a tropical lichen workshop in Puerto Rico in 1989, mainly for Puerto Rican students (although a number of Europeans and North Americans also attended) (Figs. 12, 13). He has taught lichen tutorials at the Humboldt

Figure 10 (top), Tuckerman Lichen Workshop, May 1997, in the New York State alvar region (left to right: Steve Selva, John Guccion, Jan Ciegler, Phil May, Dick Harris, Elizabeth Kneiper, Alex Ciegler, Bill Buck, Claire Schmitt, Marian Glenn, Bob Dirig, Jim Hinds, Elisabeth Lay, Pat Hinds, Lee Crane, Dave Ketzner, Ernie Brodo). Figure 11 (bottom), Tuckerman Lichen Workshop, October 1998, at Wayah Bald, NC (front row, left to right: Finnish graduate student, Alex Ciegler, Elizabeth Kneiper, Marian Glenn, Sara Webb, Melissa McCanna, Phil May, Oliver Crichton; back row, left to right: Dick Harris, Jon Dey, Elisabeth Lay, Ted Ahti, Paula DePriest, Bill Buck, Jim Hinds, Pat Hinds, ?, Joann Hoy, Jutta Buschbom, Bob Hill, Becky Yahr, Finnish graduate student).

Figures 12-13, Dick Harris at Tropical Lichen Workshop, Puerto Rico, 1989.

Field Research Institute in Eagle Hill, Maine. However, he can lose his temper if he thinks a student is lazy (the absolute worst offense) or not putting in as much effort as he thinks they should. He has only had three graduate students and all can attest to his occasional impatience with them. The first student was Lois Brako (b. 1957), who revised *Phyllopsora* for her dissertation, finishing in 1987. When Dick received his Ozark NSF grant there was funding for a graduate student and Anja Amtoft (b. 1975) was taken on for the project. Dick assigned her a genus that he had tried to understand repeatedly and failed. However, using morphological, ecological and molecular data, Anja was able to unravel the Ozark species of *Dermatocarpon* for her master's thesis, finished in 2006. Most recently, Dick is currently advising James Colin Lendemer (b. 1984) on his dissertation topic, a revision of the North American species of *Lepraria*. James came along at a good time: Dick was getting a little burned out on lichenology and repeatedly talked about retiring to full-time gardening, but James has rekindled Dick's enthusiasm and interest in lichens. It looks like Dick will have to postpone retirement for five years while James is doing his graduate work.

"Retirement," though, is a term typically applied to the end of a standard working life. Dick's career has been off that beaten path. He is notably unconventional in never having held a paid academic position. However, such is probably intentional, at least to a great degree. A story that his brother, Alan, relates, is particularly appropriate.

> I remember a time when Dick was giving me a ride in his car somewhere. Dick was well along in college and I was a mere teenager, but was apparently considered mature enough to allow serious discussion. I asked something about what Dick wanted to do in life, what the next step might be, and Dick replied with surprising intensity that he did NOT want to have a routine job or career that would consume all his daily time as our father's time had been—and then still was—consumed. At the time I was astonished both at the strength of his emotion and at his heretical use of Dad as an example not to be followed; I half expected some lightning to strike down. But true to his word, he certainly did follow a different path.

Another aspect of Dick's unconventional career is his propensity to self-publish his major works, rather than subject them to review. It also allows him to insert his personal thoughts on various aspects of lichenology which would probably be edited out in more conventional publications.

Even in this molecular era, Dick tries to keep up with advances in lichenology. He can be very opinionated about various lichenologists, both positive and negative. Dick has always zealously insisted that the American lichen biota be studied by Americans. In this regard, he can be very Europhobic, especially when a European collects in North America, and then takes all the material back home, without leaving any in American herbaria. Despite this prejudice, Dick is highly respected among his lichenological colleagues. His knowledge of most groups of lichens, especially those occurring in eastern North America, is unrivaled.

Even with his breadth of lichenological knowledge, Dick is peevishly reluctant to accept any accolades, even from his colleagues. There are several taxa named for Dick (see eponymy below) but only because they didn't first ask his approval! Of the six species named for him, he has personally synonymized two of them with older names. The only one which he reluctantly admits is appropriate is *Tremella harrisii*, a lichenicolous fungus on Trypetheliaceae: Dick feels that since he himself has parasitized the Trypetheliaceae for most of his career, naming a lichenicole on this family after him is reasonable.

Finally, I wish Dick a wonderful 70th birthday. I am sure that he will be embarrassed, and probably outright angry, at all the attention focused on him at this time. However, I hope he knows that it is done out of admiration and affection.

Eponymy

Here is a list of species named after Dick Harris. Dick himself synonymized the *Pyrenula* and *Thelenella* names!

Ditremis harrisii Makhija & Patw., Biovigyanam 16: 17. 1990; *Pleurotrema harrisii* (Makhija & Patw.) D. D. Awasthi, Lichenology in Indian Subcontinent: 16. 2000.
Pseudoparmelia harrisiana Elix & T. H. Nash, Bryologist 100: 491. 1997 [1998].
Pyrenula harrisii Hafellner & Kalb, Herzogia 9: 85. 1992.
Thelenella harrisii H. Mayrhofer, Biblioth. Lichenol. 26: 36. 1987.
Tremella harrisii Diederich, Biblioth. Lichenol. 61: 85. 1996.
Xanthoparmelia harrisii Hale, Mycotaxon 34: 547. 1989.

Bibliography

I have included as many of the "gray" publications as I am aware of. Many of these are among Dick's most important publications, providing a means of identifying lichens from various parts of the United States. Many of these are still available, thanks to the efforts of Elisabeth Lay, who has acted as Dick's publicist for many years now.

1966. A survey of the corticolous pyrenocarpous lichens of the Great Lakes region. MS thesis, Michigan State University. vi + 99 pp.
1969. *Parmentaria chilensis* Fée. Lichenologist 4: 77–82. (With H. A. Imshaug).
1971. Notes on the taxonomic relationships and chemistry of *Ramalina subdecipiens* J. Stein. Bryologist 74: 369–371. (With H. A. Imshaug).
1973. The corticolous pyrenolichens of the Great Lakes region. Michigan Bot. 12: 3–68.
1974. Key to the genera of crustose lichens of the Straits Region. Published by the author. 44 pp.
1975. Lichens of the Mackinac Straits region. I. The *Cladonia cariosa* group. Michigan Bot. 14: 44–48.
1975. *Belonia americana*, *Scoliocarpon pupula*, and *Robergia*. Contr. Univ. Michigan Herb. 11: 95–96.
1975. A taxonomic revision of the genus *Arthopyrenia* Massal. s. lat. (Ascomycetes) in North America. Ph.D. dissertation, Michigan State University. x + 291 pp.
1976. Lichens of the Straits Counties, Michigan. Published by the author. Unpaginated.
1977. An overlooked *Cladonia* name in North America. Michigan Bot. 16: 159.
1977. American Bryological and Lichenological Society Foray 1977. Mimeograph by author. 11 pp.
1977. Lichens of the Straits Counties, Michigan. 1st limited edition. Published by the author. iii + 150 pp.
1978. Lichens of the Mackinac Straits region. II. *Candelariella* Müll. Arg. Michigan Bot. 17: 155–161. (With W. R. Buck).
1978. Lichens of the Straits Counties, Michigan. Slightly revised edition. Published by the author. iii + 152 pp.
1979. The genus *Placidiopsis* Beltr. (lichenized Ascomycetes) new to North America as *Placidiopsis minor* sp. nov. Michigan Bot. 18: 57–58.
1979. Four species of *Thelopsis* Nyl. (lichenized Ascomycetes) new to North America. Bryologist 82: 77–78.
1980. New and noteworthy pyrenocarpous lichens from Louisiana and Florida. Bryologist 83: 1–20. (With S. C. Tucker).
1984. *Sticta*, an "easy" genus becomes more difficult. Evansia 1: 7–8.

1984. Name changes for some common lichens and additions to the North American lichen flora. Evansia 1: 23–24. Erratum published in Evansia 3: 3. 1985.
1984. *Megalospora porphyritis* in eastern North America. Evansia 1: 24.
1984 [1986]. The family Trypetheliaceae (Loculoascomycetes: lichenized Melanommatales) in Amazonian Brazil. Acta Amazonica 14(1/2, Supl.): 55–80.
1985. [Review] M. Pluntke: Die Flechtenflora Kubas (Flora Lichenum Cubensis). Bibliographie. 1984. Bryologist 88: 282.
1985. Two crustose lichens new to North America. Evansia 2: 10. (With J. Royte & L. Brako).
1985. Lichens of the New Jersey Pine Barrens collected on the seventh A. LeRoy Andrews Foray, 1982. Evansia 2: 44–47.
1986. *Megalospora porphyritis* again: a reply to Sipman. Evansia 3: 30.
1987. Lichens of eastern Long Island, New York collected during the 1986 Andrews Foray. Evansia 4: 1–3. (With C. K. Schmitt & K. Anderson).
1987. Additional species not recorded in "The lichens of Long Island, New York." Evansia 4: 4–5.
1987. Four lichens new to North America collected on the 1985 ABLS Foray in Florida. Evansia 4: 26–27.
1987. Some distinctive tropical pyrenolichens in the southeastern United States. Evansia 4: 28–30.
1987. The lichen collection of the Clinton Herbarium, The Buffalo Museum of Science (BUF). Evansia 4: 46–48.
1988. Corrections and additions to the fifth lichen checklist. Evansia 5: 4–5.
1988. The lichen collection of DePauw University assembled by Winona Welch, complete cryptogamist. Brittonia 40: 172–179.
1988. A sketch of the family Pyrenulaceae (Melanommatales) in eastern North America. Mem. New York Bot. Gard. 49: 74–107.
1988. *Gyalideopsis vainioi* new to North America. Evansia 5: 22. (With E. M. Wheeler.)
1988. Lichens of southern Maine collected on the 1987 Andrews Foray. Evansia 5: 26–32. (With S. B. Selva, W. R. Buck, J. G. Guccion, J. Nelson & C. Schmitt.)
1988. *Buellia* in north and central Florida or the virtues and rewards of collecting. Evansia 5: 37–45.
1989. Notes on the lichens of Goat Island, Niagara Falls. Clintonia 4(1): 1–2.
1989. Working Keys to the Lichen-Forming Fungi of Puerto Rico. Catholic University of Puerto Rico. 107 pp.
1989. Lichens. Pages 303–309. *In* H. Lieth & M. J. A. Werger (eds.), Tropical Rain Forest Ecosystems. Elsevier Science Publishers B.V., Amsterdam. (With H. J. M. Sipman.)
1990. Some Florida Lichens. Published by the author. 109 pp.
1990. Two new species of *Pyrenula* (lichenized Loculoascomycetes: Pyrenulaceae) from the West Indies. Moscosoa 6: 213–216.
1991 [1993]. A revision of *Polymeridium* (Muell. Arg.) R. C. Harris (Trypetheliaceae). Bol. Mus. Paraense Emílio Goeldi, Bot. 7: 619–644.
1992. *Cladonia petrophila*, a new species from eastern North America. Brittonia 44: 326–330.
1993. A name change for a California *Ramonia*. Bryologist 96: 474.
1993. *Hypotrachyna costaricensis* new to North America. Evansia 10: 98.
1994. Additions to the lichen flora of Missouri. Evansia 11: 131–138. (With D. Ladd & G. Wilhelm).
1994. A Guide to the Higher Groups of New York State Lichens. Published by the author for the first Tuckerman Workshop. 40 pp.
1995. The bryophytes and lichens of Rock Hill Preserve, Florida. Evansia 12: 31–39. (With D. Griffin III & W. R. Buck).
1995. More Florida Lichens Including the 10¢ Tour of the Pyrenolichens. Published by the author. 192 pp.
1995. New or rare lichens/lichenicolous fungi for North America. Evansia 12: 154–156.
1996 [1997]. *Oletheriostrigula*, a new genus for *Massarina papulosa* (Fungi, Ascomycetes). Brittonia 48: 551–555. (With S. M. Huhndorf.)
1997. The lichen collections of Merritt Lyndon Fernald and Elmer Drew Merrill, two eminent botanists from Maine. Northeastern Naturalist 4: 293–300. (With J. W. Hinds.)
1997. Reinstatement of *Lecidea cyrtidia* Tuck. in the North American lichen checklist. Evansia 14: 69–73.
1998. Lichenographia Thomsoniana: North American Lichenology in Honor of John W. Thomson. Mycotaxon Ltd., Ithaca, NY. 445 pp. (Edited with M. G. Glenn, R. Dirig & M. S. Cole.)
1998. A preliminary revision of *Pseudopyrenula* Müll. Arg. (lichenized Ascomycetes, Trypetheliaceae) with a redisposition of the names previously assigned to the genus. Pages 133–148. *In* M. G. Glenn, R. C. Harris, R. Dirig & M. S. Cole (eds.), Lichenographia Thomsoniana: North American Lichenology in Honor of John W. Thomson. Mycotaxon Ltd., Ithaca, NY.
1999. Unusual lichens under electricity pylons in zinc-enriched soil. Bryologist 102: 130–132. (With W. R. Buck, A. J. Shaw, M. D. Piercey-Normore, A. Tabaee, J. Antonovics & E. E. Crone.)
1999. Lime loving lichens. Updated edition. http://www.nybg.org/bsci/lichens/eln/lime_loving_lichens.htm.
2000. Lichenological serendipity in Putnam County, New York. Evansia 17: 23–24. (With W. R. Buck.)
2000 [2001]. *Lecanora thysanophora*, a common leprose lichen in eastern North America. Bryologist 103: 790–793. (With I. M. Brodo & T. Tønsberg.)
2001. *Leucocarpia biatorella* (Verrucariaceae), new to North America. Evansia 18: 82–83. (With W. R. Buck.)
2002. *Epigloea* (Epigloeaceae) new to North America. Evansia 19: 83–84. (With W. R. Buck)
2004. A preliminary list of the lichens of New York. Opuscula Philolichenum 1: 55–74.
2004. Molecular phylogeny of the Verrucariales. Page 15. *In* T. Randlane & A. Saag (eds.), Book of Abstracts of the 5th IAL Symposium. Lichens in Focus. Tartu University Press. (With C. Gueidan, C. Roux, W. A. Untereiner, A. Amtoft, C. Keller & F. Lutzoni.)
2004. A checklist of the lichens collected on the 28th A. Leroy Andrews Foray. Evansia 21: 88–100. (With J. C. Lendemer.)

2004. Assembling the fungal tree of life: progress, classification, and evolution of subcellular traits. American Journal of Botany 91: 1446–1480. (With F. Lutzoni, F. Kauff, C. Cox, D. McLaughlin, G. Celio, B. Dentinger, M. Padamsee, D. Hibbett, T. Y. James, E. Baloch, M. Grube, V. Reeb, V. Hofstetter, C. Schoch, A. E. Arnold, J. Miadlikowska, J. Spatafora, D. Johnson, S. Hambleton, M. Crockett, R. Shoemaker, Gi-Ho Sung, R. Lücking, T. Lumbsch, K. O'Donnell, M. Binder, P. Diederich, D. Ertz, C. Gueidan, K. Hansen, K. Hosaka, Young-Woon Lim, B. Matheny, H. Nishida, D. Pfister, J. Rogers, A. Rossman, I Schmitt, H. Sipman, J. Stone, J. Sugiyama, R. Yahr & R. Vilgalys.)
2005. Ozark Lichens: Enumerating the Lichens of the Ozark Highlands of Arkansas, Illinois, Kansas, Missouri, and Oklahoma. Published by the authors. 249 pp. (With D. Ladd.)
2005. Some name changes in *Porina* s. lat. Opuscula Philolichenum 2: 15–16.
2005. Contributions to the lichen flora of Pennsylvania: a checklist of lichens collected during the first Howard Crum Bryological Workshop, Delaware Water Gap National Recreation Area. Opuscula Philolichenum 2: 1–10. (With J. C. Lendemer.)
2006. Lichens of Limestone Rise Preserve, Albany County, New York. Evansia 23: 53–55.
2006. A preliminary glance at *Maronea* (Fuscideaceae) in North America. Opuscula Philolichenum 3: 65–68.
2006. The genus *Myriospora*. Opuscula Philolichenum 3: 1–4. (With K. Knudsen.)
2006. Contributions to the lichen flora of Pennsylvania: additions to the checklist of lichens of the Delaware Water Gap National Recreation Area. Opuscula Philolichenum 3: 69–78. (With J. C. Lendemer.)
2006. *Hypotrachyna showmanii*, a misunderstood species from eastern North America. Opuscula Philolichenum 3: 15–20. (With J. C. Lendemer.)
2007. *Heterodermia neglecta* (Physciaceae), a new lichen species from eastern North America. Bryologist 110: 490–493. (With J. C. Lendemer & E. A. Tripp.)
2007. *Lepraria normandinoides*, a new widespread species from eastern North America. Opuscula Philolichenum 4: 45–50. (With J. C. Lendemer.)
2007. New taxa of lichens and lichenicolous fungi from the Ozark Ecoregion. Opuscula Philolichenum 4: 57–68. (With D. Ladd.)
2008. Keys to Lime Loving Lichens. Published by the authors. 23 pp. (With J. C. Lendemer.)
2008. *Pertusaria appalachensis*, a new species from eastern North America. Opuscula Philolichenum 5: 77–81. (With J. C. Lendemer & J. A. Elix.)
2008. The lichen genus *Chrysothrix* in the Ozark Ecoregion, including a preliminary treatment for eastern and central North America. Opuscula Philolichenum 5: 29–42. (With D. Ladd.)
2008. *Monoblastiopsis* (Dothideomycetes, Pleosporales, incertae sedis), a new genus from the Great Plains and Ozark Highlands. Opuscula Philolichenum 5: 89–96. (With C. A. Morse.)
2009. Lichens and related fungi of Highstead Arboretum, Fairfield County, Connecticut. Opuscula Philolichenum 6: 81–86. (With D. Ladd & W. R. Buck.)
2009. Contributions to the lichen flora of Pennsylvania: Notes on the lichens of a remarkable talus slope in Huntingdon County. Opuscula Philolichenum 6: 125–136. (With J. C. Lendemer & H. M. Edenborn.)
2009. Four novel lichen taxa in the lichen biota of eastern North America. Opuscula Philolichenum 6: 149–156.
2009. The *Fellhanera silicis* group in eastern North America. Opuscula Philolichenum 6: 157–174. (With J. C. Lendemer.)
2009. Specimen based online checklists of eastern North American lichens and lichenicolous fungi available via the NYBG Virtual Herbarium. Evansia 26: 152. (With J. C. Lendemer, W. R. Buck, A. Kirchgessner & M. Tulig.)

Fieldwork

1964 to the present: Eastern North America, especially Florida and Ozarks
1967–1968: Southern Chile, Falkland Islands
1969–1970: Campbell Island, New Zealand
1971: Kerguelen
1982: Cuba, Dominican Republic
1983: Ecuador
1986: Namibia, South Africa
1987: Dominican Republic
1988: Puerto Rico
1989: Puerto Rico
1991: Dominican Republic
1992: Puerto Rico
1994: French Guiana, St. Martin, Argentina, Brazil
1996: St. Kitts & Nevis, Puerto Rico, Mona Island
1999: Canada (Nova Scotia)
2004: Canada (Nova Scotia)
2007: Canada (Newfoundland)
2008: Canada (Ontario)

New nomenclature proposed by Richard Harris

Abrothallus pezizicola Diederich & R. C. Harris *in* Diederich, n.sp., Herzogia 16: 44. 2003.
Acrocordia cavata (Ach.) R. C. Harris *in* Vězda, n.comb., Lich. Sel. Exs. 50: 2 [n. 1229]. 1974.
Acrocordia megalospora (Fink) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Anisomeridium adnexum (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 143. 1995.
Anisomeridium albidoatrum (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 144. 1995.
Anisomeridium albisedum (Nyl.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Anisomeridium ambiguum (Zahlbr.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Anisomeridium americanum (A. Massal.) R. C. Harris, n.comb., More Florida Lichens: 144. 1995.
Anisomeridium angulosum (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 144. 1995.
Anisomeridium antillarum (Vain.) R. C. Harris, n.comb., More Florida Lichens: 144. 1995.
Anisomeridium aureopunctatum R. C. Harris, n.nom., More Florida Lichens: 127. 1995.
Anisomeridium australiense (P. M. McCarthy) R. C. Harris, n.comb., More Florida Lichens: 144. 1995.
Anisomeridium biforme (Borr.) R. C. Harris *in* Vězda, n.comb., Folia Geobot. Phytotax. 20: 207. 1978.
Anisomeridium biformoides R. C. Harris, n.sp., More Florida Lichens: 127. 1995.
Anisomeridium carinthiacum (J. Steiner) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Anisomeridium complanatum (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 145. 1995.
Anisomeridium consimile (Vain.) R. C. Harris, n.comb., More Florida Lichens: 145. 1995.
Anisomeridium distans (Willey) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Anisomeridium elegans R. C. Harris, n.sp., More Florida Lichens: 145. 1995.
Anisomeridium endobryum (Döbbeler & Poelt) R. C. Harris, n.comb., More Florida Lichens: 146. 1995.
Anisomeridium epiphyllum (Vězda) R. C. Harris, n.comb., More Florida Lichens: 146. 1995.
Anisomeridium excaecariae (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 128. 1995.
Anisomeridium excellens (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 146. 1995.
Anisomeridium feeanum (Müll. Arg.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 4. 1980.
Anisomeridium finkii (R. C. Harris) R. C. Harris, n.comb., More Florida Lichens: 128. 1995.
Anisomeridium flavopallidum (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 146. 1995.
Anisomeridium glaucescens (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 146. 1995.
Anisomeridium gregale R. C. Harris, n.sp., More Florida Lichens: 146. 1995.
Anisomeridium griffinii R. C. Harris, n.sp., More Florida Lichens: 128. 1995.
Anisomeridium holopolium (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 147. 1995.
Anisomeridium immersum (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 147. 1995.
Anisomeridium indicum (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 147. 1995.
Anisomeridium infernale (Mont.) R. C. Harris, n.comb., More Florida Lichens: 147. 1995.
Anisomeridium juistense (Erichsen) R. C. Harris, n.comb., Lichenologist 12: 106. 1980.
Anisomeridium laevigatum (P. M. McCarthy) R. C. Harris, n.comb., More Florida Lichens: 147. 1995.
Anisomeridium leptospermum (Zahlbr.) R. C. Harris, n.comb., More Florida Lichens: 147. 1995.
Anisomeridium leucochlorum (Müll. Arg.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Anisomeridium megalosporum (Vain.) R. C. Harris, n.comb., More Florida Lichens: 148. 1995.
Anisomeridium monosporum (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 148. 1995.
Anisomeridium nemorosum R. C. Harris, n.sp., More Florida Lichens: 148. 1995.
Anisomeridium nidulans (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 148. 1995.
Anisomeridium nyssaegenus (Ellis & Everh.) R. C. Harris, n.comb., Evansia 2: 44. 1985.
Anisomeridium pacificum (P. M. McCarthy) R. C. Harris, n.comb., More Florida Lichens: 149. 1995.
Anisomeridium palavanum (Vain.) R. C. Harris, n.comb., More Florida Lichens: 149. 1995.
Anisomeridium phaeospermum R. C. Harris, n.sp., More Florida Lichens: 129. 1995.
Anisomeridium planiusculum (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 149. 1995.
Anisomeridium polycarpum (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 149. 1995.
Anisomeridium quadrococcum R. C. Harris, n.sp., More Florida Lichens: 129. 1995.
Anisomeridium quaternarium (R. C. Harris) R. C. Harris, n.comb., More Florida Lichens: 130. 1995.
Anisomeridium rockii (Zahlbr.) R. C. Harris, n.comb., More Florida Lichens: 149. 1995.
Anisomeridium sanfordense (Zahlbr.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Anisomeridium sphaerocarpum (Vain.) R. C. Harris, n.comb., More Florida Lichens: 149. 1995.
Anisomeridium stromaticum R. C. Harris, n.sp., More Florida Lichens: 149. 1995.
Anisomeridium subatomarium (C. Knight) R. C. Harris, n.comb., More Florida Lichens: 150. 1995.
Anisomeridium subbiforme (C. Knight) R. C. Harris, n.comb., More Florida Lichens: 150. 1995.
Anisomeridium subnectendum (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 150. 1995.
Anisomeridium subnexum (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 150. 1995.
Anisomeridium subprostans (Nyl.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 4. 1980.
Anisomeridium tamarindi (Fée) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 4. 1980.
Anisomeridium tarmugliense (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 150. 1995.

Anisomeridium terminatum (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 130. 1995.
Anisomeridium throwerae R. C. Harris, n.sp., More Florida Lichens: 150. 1995.
Anisomeridium truncatum (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 151. 1995.
Anisomeridium tuckerae R. C. Harris *in* S. C. Tucker & R. C. Harris, n.sp., Bryologist 83: 4. 1980 "*tuckeri*."
Anisomeridium ubianum (Vain.) R. C. Harris, n.comb., More Florida Lichens: 151. 1995.
Anisomeridium uniseriale (Zahlbr.) R. C. Harris, n.comb., More Florida Lichens: 151. 1995.
Anisomeridium verrucosum (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 151. 1995.
Anisomeridium viridescens (Coppins) R. C. Harris, n.comb., More Florida Lichens: 151. 1995.
Anthracothecium nanum (Zahlbr.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 79. 1989.
Anthracothecium novemseptatum (Vain.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 80. 1989.
Anthracothecium prasinum (Eschw.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Anthracothecium varians R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 80. 1989.
Arthonia montagnaei (Tuck.) R. C. Harris, n.comb., Some Florida Lichens: 41. 1990.
Arthopyrenia affinis (A. Massal.) R. C. Harris, n.comb., Michigan Bot. 12: 10. 1973.
Arthopyrenia cavata (Ach.) R. C. Harris, n.comb., Michigan Bot. 12: 11. 1973.
Arthopyrenia confluens R. C. Harris, n.nom., More Florida Lichens: 80. 1995.
Arthopyrenia degelii R. C. Harris, n.sp., More Florida Lichens: 80. 1995.
Arthopyrenia esenbeckiana (Fée) R. C. Harris, n.comb., More Florida Lichens: 81. 1995.
Arthopyrenia exasperata R. C. Harris, n.sp., More Florida Lichens: 81. 1995.
Arthopyrenia lyrata R. C. Harris *in* S. C. Tucker & R. C. Harris, n.sp., Bryologist 83: 6. 1980.
Arthopyrenia minor R. C. Harris *in* S. C. Tucker & R. C. Harris, n.sp., Bryologist 83: 7. 1980.
Arthopyrenia oblongens R. C. Harris, n.sp., More Florida Lichens: 82. 1995.
Arthopyrenia plumbaria (Stizenb.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Arthopyrenia submuriformis R. C. Harris, n.sp., Michigan Bot. 12: 15. 1973.
Arthopyrenia subvelata (Nyl.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 147. 1998.
Arthopyrenia taxodii R. C. Harris, n.sp., More Florida Lichens: 83. 1995.
Arthopyrenia tenuis R. C. Harris, n.sp., Michigan Bot. 12: 16. 1973.
Arthopyrenia willeyana R. C. Harris, n.sp., Michigan Bot. 12: 16. 1973.
Astrothelium gigasporum R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 61. 1984 [1986].
Astrothelium interjectum R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 61. 1984 [1986].
Astrothelium pseudocyphellatum R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 62. 1984 [1986].
Bacidia kekesiana R. C. Harris, n.sp., Opuscula Philolichenum 6: 149. 2009.
Bacidia phyllopsoropsis R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 3: 76. 2006.
Bactrospora brevispora R. C. Harris, n.sp., Some Florida Lichens: 39. 1990.
Bactrospora macrospora R. C. Harris, n.sp., Some Florida Lichens: 39. 1990.
Bactrospora mesospora R. C. Harris, n.sp., Some Florida Lichens: 39. 1990.
Bactrospora nematospora R. C. Harris, n.sp., Some Florida Lichens: 39. 1990.
Bathelium albidoporum (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 116. 1995.
Bathelium carolinianum (Tuck.) R. C. Harris, n.comb., More Florida Lichens: 116. 1995.
Bathelium degenerans (Vain.) R. C. Harris, n.comb., More Florida Lichens: 117. 1995.
Bathelium endochryseum (Vain.) R. C. Harris, n.comb., More Florida Lichens: 117. 1995.
Bathelium lineare (C. W. Dodge) R. C. Harris, n.comb., More Florida Lichens: 117. 1995.
Bathelium sphaericum (C. W. Dodge) R. C. Harris, n.comb., More Florida Lichens: 118. 1995.
Bathelium tuberculosum (Makhija & Patw.) R. C. Harris, n.comb., More Florida Lichens: 118. 1995.
Buellia amphidexia Imshaug *ex* R. C. Harris, n.sp., Evansia 5: 41. 1988.
Buellia imshaugiana R. C. Harris, n.sp., Some Florida Lichens: 74. 1990.
Buellia pachnidisca R. C. Harris, n.sp., Evansia 5: 43. 1988.
Buellia rappii Imshaug *ex* R. C. Harris, n.sp., Some Florida Lichens: 74. 1990.
Buellia rubifaciens R. C. Harris, n.sp., Evansia 5: 44. 1988.
Buellia wheeleri R. C. Harris, n.sp., Evansia 5: 45. 1988.
Byssoloma pubescens Vězda *ex* R. C. Harris, n.sp., More Florida Lichens: 31. 1995.
Campylothelium amylosporum (Vain.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 7. 1980.
Candelariella efflorescens R. C. Harris & W. R. Buck, n.sp., Michigan Bot. 17: 155. 1978.
Chaenotheca floridana R. C. Harris, n.sp., More Florida Lichens: 24. 1995.
Chaenothecopsis norstictica R. C. Harris, n.sp., More Florida Lichens: 27. 1995.
Chaenothecopsis rappii (Nádv.) R. C. Harris, n.comb., More Florida Lichens: 27. 1995.
Chrysothrix insulizans R. C. Harris & Ladd, n.sp., Opuscula Philolichenum 5: 35. 2008.
Chrysothrix onokoensis (Wolle) R. C. Harris & Ladd, n.comb., Opuscula Philolichenum 5: 36. 2008.
Cladonia acuminans R. C. Harris, n.sp., Opuscula Philolichenum 6: 150. 2009.
Cladonia buckii R. C. Harris, n.sp., Some Florida Lichens: 5. 1990.
Cladonia petrophila R. C. Harris, n.sp., Brittonia 44: 326. 1992.
Clathroporina isidiifera R. C. Harris, n.sp., More Florida Lichens: 171. 1995.

Clathroporina mastoidea (Ach.) R. C. Harris, n.comb., More Florida Lichens: 172. 1995.
Clathroporina subpungens (Malme) R. C. Harris, n.comb., More Florida Lichens: 172. 1995.
Clathroporina tetracerae (Ach.) R. C. Harris, n.comb., More Florida Lichens: 172. 1995.
Cryptothelium amazonum R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 65. 1984 [1986].
Cryptothelium rhodotitthon R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 65. 1984 [1986].
Cyrtidula hippocastani (DC.) R. C. Harris, n.comb., More Florida Lichens: 65. 1995.
Distopyrenis composita R. C. Harris, n.sp., More Florida Lichens: 95. 1995.
Distopyrenis quercicola R. C. Harris, n.sp., More Florida Lichens: 96. 1995.
Distopyrenis submuriformis R. C. Harris, n.sp., More Florida Lichens: 96. 1995.
Ditremis albiseda (Nyl.) R. C. Harris, n.comb., Some Florida Lichens: 31. 1990.
Ditremis ambigua (Zahlbr.) R. C. Harris, n.comb., Some Florida Lichens: 31. 1990.
Ditremis americana (A. Massal.) R. C. Harris, n.comb., Some Florida Lichens: 31. 1990.
Ditremis anisoloba (Müll. Arg.) R. C. Harris, n.comb., Some Florida Lichens: 31. 1990.
Ditremis biformis (Borrer) R. C. Harris, n.comb., Some Florida Lichens: 32. 1990.
Ditremis carinthiaca (J. Steiner) R. C. Harris, n.comb., Some Florida Lichens: 32. 1990.
Ditremis distans (Willey) R. C. Harris, n.comb., Some Florida Lichens: 32. 1990.
Ditremis finkii R. C. Harris, n.sp., Some Florida Lichens: 32. 1990.
Ditremis leucochlora (Müll. Arg.) R. C. Harris, n.comb., Some Florida Lichens: 33. 1990.
Ditremis limitans (Nyl.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Ditremis macrospora R. C. Harris, n.sp., Some Florida Lichens: 33. 1990.
Ditremis nyssaegena (Ellis & Everh.) R. C. Harris, n.comb., Some Florida Lichens: 33. 1990.
Ditremis quaternaria R. C. Harris, n.sp., Some Florida Lichens: 34. 1990.
Ditremis sanfordensis (Zahlbr.) R. C. Harris, n.comb., Some Florida Lichens: 34. 1990.
Ditremis subprostans (Nyl.) R. C. Harris, n.comb., Some Florida Lichens: 34. 1990.
Ditremis tamarindi (Fée) R. C. Harris, n.comb., Some Florida Lichens: 34. 1990.
Ditremis terminata (Nyl.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987; and Some Florida Lichens: 35. 1990.
Ditremis tuckerae (R. C. Harris) R. C. Harris, n.comb., Some Florida Lichens: 35. 1990.
Enterographa carnea (Eckf.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Enterographa lecanoroides R. C. Harris, n.sp., Some Florida Lichens: 42. 1990.
Eopyrenula R. C. Harris, n.gen., Michigan Bot. 12: 19. 1973.
Eopyrenula leucoplaca (Wallr.) R. C. Harris, n.comb., Michigan Bot. 12: 19. 1973.
Eopyrenula parvispora R. C. Harris & Aptroot *in* Aptroot, n.sp., Biblioth. Lichenol. 44: 115. 1991.
Exiliseptum R. C. Harris, n.gen., Acta Amazonica 14(1/2, Supl.): 65. 1984 [1986].
Exiliseptum ocellatum (Müll. Arg.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 66. 1984 [1986].
Fellhanera eriniae R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 6: 165. 2009.
Fellhanera fallax R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 6: 166. 2009.
Fellhanera granulosa R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 6: 167. 2009.
Fellhanera hybrida R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 6: 168. 2009.
Fellhanera minnisinkorum R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 6: 169. 2009.
Fellhanera montesfumosi R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 6: 170. 2009.
Fellhanera silicis R. C. Harris & Ladd *in* R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 6: 161. 2009.
Fuscidea placidensis (H. Magn.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Granulopyrenis nigrescens (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 98. 1995.
Graphina floridana (Tuck.) R. C. Harris, n.comb., Some Florida Lichens: 14. 1990.
Graphina intertexta (Müll. Arg.) R. C. Harris, n.comb., Some Florida Lichens: 14. 1990.
Graphina xylophaga R. C. Harris, n.sp., Some Florida Lichens: 14. 1990.
Graphis chromothecia R. C. Harris, n.sp., Some Florida Lichens: 19. 1990.
Graphis haleana R. C. Harris, n.sp., Some Florida Lichens: 20. 1990.
Graphis illiterata R. C. Harris, n.sp., Some Florida Lichens: 20. 1990.
Graphis inversa R. C. Harris, n.sp., Some Florida Lichens: 21. 1990.
Graphis lucifica R. C. Harris, n.sp., Some Florida Lichens: 22. 1990.
Gyalideopsis ozarkensis Lücking, W. R. Buck & R. C. Harris *in* Lücking, W. R. Buck & Rivas Plata, n.sp., Bryologist 110: 655. 2007.
Hertelidea pseudobotryosa R. C. Harris, Ladd & Printzen *in* Printzen & Kantvilas, n.sp., Biblioth. Lichenol. 88: 549. 2004.
Heterodermia crocea R. C. Harris, n.sp., Some Florida Lichens: 78. 1990.
Heterodermia neglecta Lendemer, R. C. Harris & E. Tripp, n.sp., Bryologist 110: 490. 2007.
Jarxia ilicicola R. C. Harris, n.sp., More Florida Lichens: 60. 1995.
Julella asema R. C. Harris, n.sp., More Florida Lichens: 86. 1995.
Julella decolorans (Riddle) R. C. Harris, n.comb., More Florida Lichens: 87. 1995.
Julella dispora (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 87. 1995.
Julella exiguella (Bailey) R. C. Harris, n.comb., More Florida Lichens: 87. 1995.
Julella fallaciosa (Stizenb. *ex* Arnold) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.

Julella geminella (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 87. 1995.
Julella sublactea (Nyl.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Julella taxodii R. C. Harris, n.sp., More Florida Lichens: 88. 1995.
Julella variiformis R. C. Harris, n.sp., More Florida Lichens: 89. 1995.
Laurera aurata R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 67. 1984 [1986].
Laurera subdisjuncta (Müll. Arg.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 66. 1984 [1986].
Lecanactis ravenelii (Tuck.) R. C. Harris, n.comb., Some Florida Lichens: 43. 1990.
Lecanactis subattingens (Nyl.) R. C. Harris, n.comb., Some Florida Lichens: 43. 1990.
Lecanora caesiorubella subsp. *prolifera* (Fink) R. C. Harris *in* Vězda, n.comb., Lich. Sel. Exs. 60: 5 [n. 1491]. 1977.
Lecanora thysanophora R. C. Harris *in* R. C. Harris, Brodo & Tønsberg, n.sp., Bryologist 103: 790. 2000 [2001].
Lecidella granulata (H. Magn.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Lecidella placidensis (H. Magn.) R. C. Harris, n.comb., Evansia 5: 4. 1988.
Leiomonis R. C. Harris, n.gen., Opuscula Philolichenum 6: 151. 2009.
Leiomonis erratica (Körb.) R. C. Harris, n.comb., Opuscula Philolichenum 6: 151. 2009.
Lepraria caesiella R. C. Harris *in* Lendemer, n.sp., Opuscula Philolichenum 2: 51. 2005.
Lepraria finkii (de Lesd.) R. C. Harris, n.comb., Evansia 2: 45. 1985.
Lepraria lesdainii (Hue) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Lepraria normandinoides Lendemer & R. C. Harris, n.sp., Opuscula Philolichenum 4: 45. 2007.
Lepraria vouauxii (Hue) R. C. Harris *in* Egan, n.comb., Bryologist 90: 163. 1987.
Lithothelium almbornii R. C. Harris & Aptroot *in* Aptroot, n.sp., Biblioth. Lichenol. 44: 51. 1991.
Lithothelium microsporum R. C. Harris, n.sp., More Florida Lichens: 99. 1995.
Lithothelium submuriforme R. C. Harris & Aptroot *in* Aptroot, n.sp., Biblioth. Lichenol. 44: 69. 1991.
Loxospora ochrophaea (Tuck.) R. C. Harris *in* Egan, n.comb., Bryologist 93: 217. 1990.
Loxospora pustulata (Brodo & W. Culb.) R. C. Harris *in* Egan, n.comb., Bryologist 93: 217. 1990.
Mazosia ocellata (Nyl.) R. C. Harris, n.comb., Some Florida Lichens: 43. 1990.
Megalospora porphyritis (Tuck.) R. C. Harris, n.comb., Evansia 1: 24. 1984.
Micarea chlorosticta (Tuck.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Micarea endocyanea (Tuck. *ex* Willey) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Monoblastia borinquensis R. C. Harris, n.sp., More Florida Lichens: 132. 1995.
Monoblastia buckii R. C. Harris, n.sp., Some Florida Lichens: 36. 1990.
Monoblastia cypressi R. C. Harris, n.sp., More Florida Lichens: 132. 1995.
Monoblastia echinulospora (Riddle) R. C. Harris, n.comb., Some Florida Lichens: 36. 1990.
Monoblastia quisqueyana R. C. Harris, n.sp., More Florida Lichens: 132. 1995.
Monoblastiopsis R. C. Harris & C. A. Morse, n.gen., Opuscula Philolichenum 5: 90. 2008.
Monoblastiopsis konzana R. C. Harris & C. A. Morse, n.sp., Opuscula Philolichenum 5: 92. 2008.
Monoblastiopsis nigrocortina R. C. Harris & C. A. Morse, n.sp., Opuscula Philolichenum 5: 93. 2008.
Musaespora epiphylla (R. Sant.) R. C. Harris, n.comb., More Florida Lichens: 133. 1995.
Musaespora gigas (Zahlbr.) R. C. Harris, n.comb., More Florida Lichens: 133. 1995.
Mycoglaena myricae (Nyl.) R. C. Harris, n.comb., Michigan Bot. 12: 29. 1973.
Mycoglaena quercicola R. C. Harris, n.sp., Michigan Bot. 12: 30. 1973.
Mycomicrothelia decipiens (Müll. Arg.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 78. 1989.
Mycoporum acervatum R. C. Harris, n.sp., More Florida Lichens: 66. 1995.
Mycoporum antecellens (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 66. 1995.
Mycoporum buckii R. C. Harris, n.sp., More Florida Lichens: 68. 1995.
Mycoporum californicum (Zahlbr.) R. C. Harris, n.comb., More Florida Lichens: 68. 1995.
Mycoporum compositum (A. Massal.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Mycoporum eschweileri (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 69. 1995.
Mycoporum flotowianum (Körb.) R. C. Harris, n.comb., Michigan Bot. 12: 31. 1973.
Mycoporum lacteum (Ach.) R. C. Harris, n.comb., More Florida Lichens: 69. 1995.
Mycoporum mycoporoides (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 69. 1995.
Mycoporum uniloculatum R. C. Harris, n.sp., More Florida Lichens: 70. 1995.
Myrionora R. C. Harris *in* R. C. Harris, S. Selva, W. R. Buck, J. Guccion, J. Nelson & C. Schmitt, n.gen., Evansia 5: 27. 1988.
Myrionora albidula (Willey) R. C. Harris *in* R. C. Harris, S. Selva, W. R. Buck, J. Guccion, J. Nelson & C. Schmitt, n.comb., Evansia 5: 27. 1988.
Myriospora immersa (J. Hedrick) R. C. Harris, n.comb., Opuscula Philolichenum 1: 70. 2004.
Myriotrema erodens R. C. Harris, n.sp., Some Florida Lichens: 89. 1990.
Myriotrema peninsulae R. C. Harris, n.sp., Some Florida Lichens: 90. 1990.
Nadvornikia sorediata R. C. Harris, n.sp., Some Florida Lichens: 90. 1990.
Naetrocymbaceae Höhn. *ex* R. C. Harris, n.fam., More Florida Lichens: 59. 1995.
Naetrocymbe atomarioides (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 62. 1995.
Naetrocymbe atractospora (Zahlbr.) R. C. Harris, n.comb., More Florida Lichens: 62. 1995.
Naetrocymbe cedrina (Zahlbr.) R. C. Harris, n.comb., More Florida Lichens: 62. 1995.

Naetrocymbe fraxini (A. Massal.) R. C. Harris, n.comb., More Florida Lichens: 62. 1995.
Naetrocymbe massalongiana (Hepp) R. C. Harris, n.comb., More Florida Lichens: 62. 1995.
Naetrocymbe megalospora (Lönnr.) R. C. Harris, n.comb., More Florida Lichens: 62. 1995.
Naetrocymbe punctiformis (Pers.) R. C. Harris, n.comb., More Florida Lichens: 63. 1995.
Naetrocymbe quassiaecola (Fée) R. C. Harris, n.comb., More Florida Lichens: 63. 1995.
Naetrocymbe rhyponta (Ach.) R. C. Harris, n.comb., More Florida Lichens: 63. 1995.
Naetrocymbe saxicola (A. Massal.) R. C. Harris, n.comb., More Florida Lichens: 63. 1995.
Ocellularia leiostoma (Tuck.) R. C. Harris, n.comb., Some Florida Lichens: 93. 1990.
Ocellularia retispora R. C. Harris, n.sp., Some Florida Lichens: 93. 1990.
Ochrolechiaceae R. C. Harris *ex* Lumbsch & I. Schmitt *in* I. Schmitt, Yamam. & Lumbsch, n.fam., J. Hattori Bot. Lab. 100: 760. 2006.
Oletheriostrigula S. M. Huhndorf & R. C. Harris, n.gen., Brittonia 48: 551. 1996 [1997].
Oletheriostrigula papulosa (Durieu & Mont.) S. M. Huhndorf & R. C. Harris, n.comb., Brittonia 48: 551. 1996 [1997].
Opegrapha bicolor R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 2: 10. 2005.
Opegrapha cypressi R. C. Harris, n.sp., Some Florida Lichens: 46. 1990.
Opegrapha diffracticola R. C. Harris & Ladd, n.sp., Opuscula Philolichenum 4: 58. 2007.
Pachyphysis ozarkana R. C. Harris & Ladd, n.gen. & sp., Opuscula Philolichenum 4: 60. 2007.
Parmeliopsis capitata R.C. Harris *in* J. W. Hinds & P. L. Hinds, Lichenographia Thomsoniana: 357. 1998.
Parmentaria nana (Zahlbr.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Pertusaria appalachensis Lendemer, R. C. Harris & Elix, n.sp., Opuscula Philolichenum 5: 77. 2008.
Pertusaria epixantha R. C. Harris, n.sp., Some Florida Lichens: 60. 1990.
Pertusaria expolita R. C. Harris, n.sp., Some Florida Lichens: 60. 1990.
Pertusaria iners R. C. Harris, n.sp., Some Florida Lichens: 61. 1990.
Pertusaria obruta R. C. Harris, n.sp., Some Florida Lichens: 62. 1990.
Pertusaria virensica R. C. Harris, n.sp., Some Florida Lichens: 62. 1990.
Phaeographis multicolor R. C. Harris, n.sp., Some Florida Lichens: 27. 1990.
Phaeosporobolus fellhanerae R. C. Harris & Lendemer, n.sp., Opuscula Philolichenum 6: 173. 2009.
Phoebus hydrophobius R. C. Harris & Ladd, n.gen. & sp., Opuscula Philolichenum 4: 64. 2007.
Physcia neogaea R. C. Harris, n.sp., Some Florida Lichens: 81. 1990.
Physcia pumilior R. C. Harris, n.sp., Some Florida Lichens: 82. 1990.
Placidiopsis minor R. C. Harris, n.sp., Michigan Bot. 18: 57. 1979.
Plagiocarpa R. C. Harris, n.gen., Michigan Bot. 12: 34. 1973.
Plagiocarpa subg. *Pyrenulopsis* R. C. Harris *in* S. C. Tucker & R. C. Harris, n.subg., Bryologist 83: 10. 1980.
Plagiocarpa acrocordioides (Zahlbr.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 81. 1989.
Plagiocarpa hyalospora (Nyl.) R. C. Harris, n.comb., Michigan Bot. 12: 34. 1973.
Plagiocarpa illota (Nyl.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Plagiocarpa langloisii R. C. Harris *in* S. C. Tucker & R. C. Harris, n.sp., Bryologist 83: 10. 1980.
Plagiocarpa macrospora R. C. Harris, n.sp., Michigan Bot. 12: 36. 1973.
Plagiocarpa phaeospora R. C. Harris, n.sp., Michigan Bot. 12: 36. 1973.
Plagiocarpa septemseptata R. C. Harris, n.sp., Michigan Bot. 12: 37. 1973.
Pleurotrema acrophaeum (Müll. Arg.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 69. 1984 [1986].
Polymeridium (Müll. Arg.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.stat., Bryologist 83: 12. 1980.
Polymeridium albidum (Müll. Arg.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 69. 1984 [1986].
Polymeridium albocinereum (Kremp.) R. C. Harris, n.comb., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 625. 1991 [1993].
Polymeridium amyloideum R. C. Harris, n.sp., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 626. 1991 [1993].
Polymeridium biloculare R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 70. 1984 [1986].
Polymeridium catapastum (Nyl.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 70. 1984 [1986].
Polymeridium chioneum (Mont.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 141. 1998.
Polymeridium cinereonigricans (Vain.) R. C. Harris, n.comb., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 631. 1991 [1993].
Polymeridium contendens (Nyl.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 12. 1980.
Polymeridium dithecium R. C. Harris, n.sp., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 632. 1991 [1993].
Polymeridium endocrocinum R. C. Harris, n.sp., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 633. 1991 [1993].
Polymeridium flavothecium R. C. Harris, n.sp., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 633. 1991 [1993].
Polymeridium glaucoatrum (Vain.) R. C. Harris, n.comb., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 634. 1991 [1993].
Polymeridium neblinae R. C. Harris, n.sp., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 635. 1991 [1993].
Polymeridium oculatum (Müll. Arg.) R. C. Harris, n.comb., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 635. 1991 [1993].
Polymeridium pleiomerellum (Müll. Arg.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Polymeridium pleiomeroides (Müll. Arg.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 70. 1984 [1986].
Polymeridium pleurothecium R. C. Harris, n.sp., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 636. 1991 [1993].
Polymeridium proponens (Nyl.) R. C. Harris, n.comb., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 637. 1991 [1993].
Polymeridium quinqueseptatum (Nyl.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 12. 1980.
Polymeridium simulans R. C. Harris, n.sp., Bol. Mus. Paraense E. Goeldi, Sér. Bot. 7(2): 641. 1991 [1993].

Polymeridium subcinereum (Nyl.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 12. 1980.
Polymeridium sulphurescens (Müll. Arg.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 147. 1998.
Porina heterospora (Fink) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 12. 1980.
Porina nuculastrum (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 174. 1995.
Porina scabrida R. C. Harris, n.sp., More Florida Lichens: 174. 1995.
Pseudosagedia cestrensis (Michener) R. C. Harris, n.comb., Opuscula Philolichenum 2: 15. 2005.
Pseudosagedia crocynioides (R. C. Harris) R. C. Harris, n.comb., Opuscula Philolichenum 2: 15. 2005.
Pseudosagedia isidiata (R. C. Harris) R. C. Harris, n.comb., Opuscula Philolichenum 2: 15. 2005.
Pseudosagedia rhaphidosperma (Müll. Arg.) R. C. Harris, n.comb., Opuscula Philolichenum 2: 15. 2005.
Pyrenocollema atlanticum (Vain.) R. C. Harris, n.comb., More Florida Lichens: 72. 1995.
Pyrenocollema caesia (Nyl.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Pyrenocollema ceuthocarpoides (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 72. 1995.
Pyrenocollema epigloeum (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 72. 1995.
Pyrenocollema farlowii (Riddle) R. C. Harris, n.comb., More Florida Lichens: 72. 1995.
Pyrenocollema halodytes (Nyl.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Pyrenocollema prospersella (Nyl.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 13. 1980.
Pyrenocollema strontianensis (Swinscow) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Pyrenocollema sublitorale (Leighton) R. C. Harris *ex* A. Fletcher *in* Coppins, P. James & D. Hawksw., n.comb., Lichenologist 24: 368. 1922.
Pyrenocollema tichothecioides (Arnold) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 13. 1980.
Pyrenocollema zonatum (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 73. 1995.
Pyrenographa irregularis (Wehm.) R. C. Harris, n.comb., More Florida Lichens: 100. 1995.
Pyrenowilmsia R. C. Harris & Aptroot *in* Aptroot, n.gen., Biblioth. Lichenol. 44: 75. 1991.
Pyrenowilmsia ferruginosa (Müll. Arg.) R. C. Harris & Aptroot *in* Aptroot, n.comb., Biblioth. Lichenol. 44: 75. 1991.
Pyrenula acutalis R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 85. 1989.
Pyrenula aquila R. C. Harris *in* S. C. Tucker & R. C. Harris, n.sp., Bryologist 83: 13. 1980.
Pyrenula astroidea (Fée) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 87. 1989.
Pyrenula atrolaminata R. C. Harris, n.sp., More Florida Lichens: 107. 1995.
Pyrenula balia (Kremp.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 141. 1998.
Pyrenula caryae R. C. Harris, n.sp., More Florida Lichens: 107. 1995.
Pyrenula chilensis (Fée) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 102. 1989.
Pyrenula citriformis R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 87. 1989.
Pyrenula concastroma R. C. Harris, n.sp., More Florida Lichens: 108. 1995.
Pyrenula concatervans (Nyl.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 15. 1980.
Pyrenula confinis (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 109. 1995.
Pyrenula confoederata R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 89. 1989.
Pyrenula corticata (Müll. Arg.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 89. 1989.
Pyrenula cruentata (Müll. Arg.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Pyrenula cubana (Müll. Arg.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 91. 1989.
Pyrenula cuyabensis (Malme) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 91. 1989.
Pyrenula erumpens R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 91. 1989.
Pyrenula falsaria (Zahlbr.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 92. 1989.
Pyrenula fulvella R. C. Harris, n.nom., Mem. New York Bot. Gard. 49: 92. 1989.
Pyrenula imperfecta (Ellis & Everh.) R. C. Harris, n.comb., Michigan Bot. 12: 43. 1973.
Pyrenula kermesina R. C. Harris, n.sp., Moscosoa 6: 214. 1990.
Pyrenula lucifera R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 94. 1989.
Pyrenula macounii R. C. Harris, n.sp., Michigan Bot. 12: 45. 1973.
Pyrenula macularis (Zahlbr.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 94. 1989.
Pyrenula maculata (R. C. Harris) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Pyrenula martinicana (Vain.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 96. 1989.
Pyrenula massariospora (Starb.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 95. 1989.
Pyrenula micheneri R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 96. 1989.
Pyrenula microtheca R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 96. 1989.
Pyrenula mucosa (Vain.) R. C. Harris, n.comb., More Florida Lichens: 110. 1995.
Pyrenula neglecta R. C. Harris, n.sp., Michigan Bot. 12: 45. 1973.
Pyrenula neglecta subsp. *occidentalis* R. C. Harris, n.ssp., Michigan Bot. 12: 51. 1973.
Pyrenula nitidella var. *maculata* R.C. Harris *in* W. A. Weber, n.var., Lich. Exs. 11–12: [12] [n. 443]. 1975.
Pyrenula nitidula (Bresadola) R. C. Harris *in* Aptroot, Diederich, Sérusiaux & Sipman, Biblioth. Lichenol. 64: 164. 1997.
Pyrenula obvoluta (Nyl.) R. C. Harris & Aptroot *in* Aptroot, n.comb., Biblioth. Lichenol. 44: 79. 1991.
Pyrenula occidentalis (R. C. Harris) R. C. Harris *in* Ahti, Brodo & W. Noble, n.comb., Mycotaxon 28: 96. 1987.
Pyrenula ochraceoflava (Nyl.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 96. 1989.
Pyrenula ochraceoflavens (Nyl.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 97. 1989.

Pyrenula oleosa R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 97. 1989.
Pyrenula personata (Malme) R. C. Harris, n.comb., Moscosoa 6: 216. 1990.
Pyrenula plittii R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 97. 1989.
Pyrenula pseudobufonia (Rehm) R. C. Harris, n.comb., Evansia 2: 46. 1985.
Pyrenula pyrenuloides (Mont.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 99. 1989.
Pyrenula ravenelii (Tuck.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 99. 1989.
Pyrenula rubrostoma R. C. Harris *in* S. C. Tucker & R. C. Harris, n.sp., Bryologist 83: 16. 1980.
Pyrenula septicollaris (Eschw.) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 101. 1989.
Pyrenula spectata R. C. Harris, n.sp., Moscosoa 6: 213. 1990.
Pyrenula subdecolor (Nyl.) R. C. Harris, n.comb., Evansia 4: 29. 1987.
Pyrenula subelliptica (Tuck.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Pyrenula subferruginea (Malme) R. C. Harris, n.comb., Mem. New York Bot. Gard. 49: 101. 1989.
Pyrenula tenuisepta R. C. Harris, n.sp., Mem. New York Bot. Gard. 49: 101. 1989.
Pyrenula texana R. C. Harris *in* S. C. Tucker & R. C. Harris, n.sp., Bryologist 83: 16. 1980.
Pyrenula wetmorei R. C. Harris, n.sp., Some Florida Lichens: 69. 1990.
Pyrenula wheeleri R. C. Harris, n.sp., Some Florida Lichens: 69. 1990.
Pyrenula wrightii (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 111. 1995.
Pyrrhospora varians (Ach.) R. C. Harris, n.comb., Evansia 2: 47. 1985.
Ramonia ablephora (Hasse) R. C. Harris, n.comb., Bryologist 96: 474. 1993.
Requienella subcollapsa (Ellis & Everh.) R. C. Harris, n.comb., More Florida Lichens: 112. 1995.
Robergea pupula (Nyl.) R. C. Harris, n.comb., Contr. Univ. Mich. Herb. 11: 95. 1975.
Schismatomma glaucescens (Nyl. *ex* Willey) R. C. Harris, n.comb., Some Florida Lichens: 47. 1990.
Schismatomma rappii (Zahlbr.) R. C. Harris, n.comb., Evansia 5: 5. 1988.
Scoliciosporum pensylvanicum R. C. Harris, n.sp., Opuscula Philolichenum 6: 152. 2009.
Segestria leptalea (Durieu & Mont.) R. C. Harris, n.comb., More Florida Lichens: 175. 1995.
Segestria octomera (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 176. 1995.
Segestria rubentior (Stirt.) R. C. Harris, n.comb., More Florida Lichens: 176. 1995.
Strigula affinis (A. Massal.) R. C. Harris, n.comb., Lichenologist 12: 107. 1980 [Feb]; and *in* S. C. Tucker & R. C. Harris Bryologist 83: 18. 1980 [Mar].
Strigula albicascens (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 154. 1995.
Strigula albolinitum (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 155. 1995.
Strigula americana R. C. Harris *in* S. C. Tucker & R. C. Harris, n.nom., Bryologist 83: 18. 1980.
Strigula bahamensis (Riddle) R. C. Harris, n.comb., More Florida Lichens: 155. 1995.
Strigula bermudana (Tuck. *ex* Nyl.) R. C. Harris, n.comb., More Florida Lichens: 155. 1995.
Strigula cinefaciens (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 155. 1995.
Strigula connivens R. C. Harris, n.sp., More Florida Lichens: 155. 1995.
Strigula fracticonidia R. C. Harris, n.sp., More Florida Lichens: 156. 1995.
Strigula griseonitens R. C. Harris, n.sp., More Florida Lichens: 156. 1995.
Strigula hypothallina R. C. Harris, n.sp., More Florida Lichens: 157. 1995.
Strigula inductula (Nyl.) R. C. Harris, n.comb., More Florida Lichens: 157. 1995.
Strigula jamesii (Swinscow) R. C. Harris, n.comb., Lichenologist 12: 107. 1980.
Strigula laceribracae R. C. Harris, n.sp., More Florida Lichens: 158. 1995.
Strigula multipunctata (R. Sant.) R. C. Harris, n.comb., More Florida Lichens: 158. 1995.
Strigula obducta (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 158. 1995.
Strigula obtecta (Vain.) R. C. Harris, n.comb., More Florida Lichens: 158. 1995.
Strigula phaea (Ach.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 18. 1980.
Strigula phyllogena (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 159. 1995.
Strigula platypoda (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 159. 1995.
Strigula rostrata R. C. Harris & Aptroot, n.sp., More Florida Lichens: 159. 1995.
Strigula stigmatella (Ach.) R. C. Harris, n.comb., Lichenologist 12: 107. 1980.
Strigula submuriformis (R. C. Harris) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Strigula sychnogonioides (Nitschke) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Strigula taganannae (Harm.) R. C. Harris, n.comb., More Florida Lichens: 160. 1995.
Strigula taylorii (Carroll *ex* Nyl.) R. C. Harris, n.comb., Lichenologist 12: 108. 1980.
Strigula viridis (Lücking) R. C. Harris, n.comb., More Florida Lichens: 160. 1995.
Strigula viridiseda (Nyl.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 18. 1980.
Strigula wilsonii (Riddle) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Thelenella cinerascens (Vain.) R. C. Harris, n.comb., More Florida Lichens: 165. 1995.
Thelenella fugiens (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 165. 1995.
Thelenella geminipara (Malme) R. C. Harris, n.comb., More Florida Lichens: 165. 1995.
Thelenella humilis R. C. Harris, n.sp., More Florida Lichens: 165. 1995.
Thelenella rappii R. C. Harris, n.sp., More Florida Lichens: 166. 1995.

Thelenella sastreana R. C. Harris, n.sp., More Florida Lichens: 166. 1995.
Thelenella sychnogonioides (Zahlbr.) R. C. Harris, n.comb., More Florida Lichens: 167. 1995.
Thelenella trichothelioides (Sérusiaux & Vězda) R. C. Harris, n.comb., More Florida Lichens: 167. 1995.
Thelotrema defectum Hale *ex* R. C. Harris, n.sp., Some Florida Lichens: 96. 1990.
Thelotrema eximium R. C. Harris, n.sp., Some Florida Lichens: 97. 1990.
Thelotrema floridense R. C. Harris, n.sp., Some Florida Lichens: 98. 1990.
Thelotrema monospermum R. C. Harris, n.sp., Some Florida Lichens: 99. 1990.
Tomasellia americana (Minks *ex* Willey) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 19. 1980.
Tomasellia californica (Zahlbr.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Tomasellia eschweileri (Müll. Arg.) R. C. Harris *in* S. C. Tucker & R. C. Harris, n.comb., Bryologist 83: 19. 1980.
Tomasellia lactea (Ach.) R. C. Harris, n.comb., Lichenologist 12: 108. 1980 [Feb]; and *in* S. C. Tucker & R. C. Harris, Bryologist 83: 19. 1980 [Mar].
Tomasellia macularis (Minks *ex* Willey) R. C. Harris, n.comb., More Florida Lichens: 65. 1995.
Tomasellia sparsella (Nyl.) R. C. Harris *in* Egan, n.comb., Bryologist 90: 164. 1987.
Trichothelium aeneum (Wallr.) R. C. Harris, n.comb., More Florida Lichens: 178. 1995.
Trichothelium cestrense (E. Michener) R. C. Harris, n.comb., More Florida Lichens: 178. 1995.
Trichothelium chloroticum (Ach.) R. C. Harris, n.comb., More Florida Lichens: 179. 1995.
Trichothelium crocynioides R. C. Harris, n.sp., More Florida Lichens: 179. 1995.
Trichothelium guentheri (Flotow) R. C. Harris, n.comb., More Florida Lichens: 179. 1995.
Trichothelium isidiatum R. C. Harris, n.sp., More Florida Lichens: 180. 1995.
Trichothelium lineare (Leighton) R. C. Harris, n.comb., More Florida Lichens: 180. 1995.
Trichothelium nitidulum (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 180. 1995.
Trichothelium rhaphidospermum (Müll. Arg.) R. C. Harris, n.comb., More Florida Lichens: 180. 1995.
Trichothelium thaxteri (R. Sant.) R. C. Harris, n.comb., More Florida Lichens: 180. 1995.
Trypethelium basilicum (Kremp.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 141. 1998.
Trypethelium buckii R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 72. 1984 [1986].
Trypethelium calosporum (Müll. Arg.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 141. 1998.
Trypethelium ceratinum (Fée) R. C. Harris, n.comb., Lichenographia Thomsoniana: 141. 1998.
Trypethelium cinereoglaucescens (Vain.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 141. 1998.
Trypethelium elmeri (Vain.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 143. 1998.
Trypethelium floridanum (Zahlbr. *ex* M. Choisy) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 73. 1984 [1986].
Trypethelium infossum (Nyl.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 144. 1998.
Trypethelium karnatakense R. C. Harris, n.nom., More Florida Lichens: 147. 1995.
Trypethelium neogalbineum R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 74. 1984 [1986].
Trypethelium nitidiusculum (Nyl.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 75. 1984 [1986].
Trypethelium pupula (Ach.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 146. 1998.
Trypethelium thelotremoides (Nyl.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 73. 1984 [1986].
Trypethelium trypethelizans (Nyl.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 148. 1998.
Trypethelium tuberculosum (Vain.) R. C. Harris, n.comb., Acta Amazonica 14(1/2, Supl.): 76. 1984 [1986].
Trypethelium ubianense (Vain.) R. C. Harris, n.comb., Lichenographia Thomsoniana: 148. 1998.
Trypethelium violascens R. C. Harris, n.sp., Acta Amazonica 14(1/2, Supl.): 79. 1984 [1986].
Verrucaria riddleana R. C. Harris, n.nom., More Florida Lichens: 24. 1995.
Xyleborus sporodochifer R. C. Harris & Ladd, n.gen. & sp., Opuscula Philolichenum 4: 65. 2007.
Zwackhiomyces arenicola R. C. Harris, n.sp., More Florida Lichens: 73. 1995.

Acknowledgments

I very much appreciate the information and photographs that I received from Dick's sister, Pat, and brother, Alan. Both provided valuable information for years prior to the time that I met Dick. Alan Fryday helpfully provided dates of Dick's sub-Antarctic fieldwork. Dale Vitt provided the photograph of Dick during this period of his fieldwork. Carol Gracie graciously provided the photograph of Dick in French Guiana. I particularly appreciate Joy Runyon's attempts to make my writing more fluid.

Opuscula Philolichenum, **7**: 1-6. 2009.

Calvitimela talayana (Ascomycotina, Lecanorales), an interesting disjunction in North America

Irwin M. Brodo[1]

ABSTRACT. – *Calvitimela talayana*, an arctic-alpine lichen described from Siberia, has been found growing on talus in Shenandoah National Park at relatively high elevations. Based on this discovery, it has recently been listed as new to North America. Additional specimens from Nunavut and the Northwest Territories in Canada were also verified, so the lichen is also new to Canada.

Introduction

In 2005, a group of botanists and ecologists working on the Shenandoah National Rock Outcrop Management Project discovered a well-developed yellow-green crustose lichen growing on the vertical side of a rock wall on an open quartzite talus field. It had no mature apothecia, although it formed well-developed, hemispherical mounds of greenish soredia. The specimen was sent to the New York Botanical Gardens for identification and then to the Canadian Museum of Nature because of the possibility that it had boreal-arctic affinities. Two sorediate, arctic-alpine species of *Lecanora, L. kariana* Räsänen and *L. chloroleprosa* (Vain.) H. Magn., seemed similar, based on published descriptions and specimens tentatively named as such in CANL. (Neither species was included in Thomson [1997], probably because both specimens had only provisional names.) However, pycnidia on the Shenandoah specimen had short, bacilliform conidia rather than long, filiform conidia as one would expect from a species of *Lecanora*. Its chemistry was rather special, including usnic acid, atranorin and two fatty acids: rangiformic and norrangiformic acids, and an additional unidentified substance. The CANL specimen named as *Lecanora kariana* from Wagner Bay near Southampton Island (now in Nunavut), and the specimen of *L. chloroleprosa* from the Mackenzie District near MacKay Lake (Northwest Territories), had the same unusual chemistry and greenish soredia. There could be little doubt that all three were the same species.... but which species?

The type of *Lecanora kariana* was borrowed from Helsinki [H]. It had already been examined and annotated in 1985 by Heino Vänskä, who noted that it contained norstictic acid. The specimen has small areoles and laminal excavate soralia containing fine, blackish to yellow-green soredia, less than 30µm in diameter, clearly different from the Wagner Bay specimen in CANL. A specimen of *L. chloroleprosa* from Sweden in CANL contains usnic acid, a trace of zeorin and possibly placodiolic acid. The areoles are much smaller and more scattered than the material from the Northwest Territories. Thus, both Canadian specimens in CANL under *L. kariana* and *L. chloroleprosa* were incorrectly identified, and the Shenandoah specimen remained a mystery.

A reexamination of the original Shenandoah material turned up an aborted apothecium with no spores, but with a deep greenish (aeruginose) epihymenium. This, together with the shiny areoles and black prothallus, suggested a possible relationship to *Tephromela armeniaca* (DC.) Hertel & Rambold or *T. aglaea* (Sommerf.) Hertel & Rambold. A literature search revealed that Haugan and Timdal (1994) had recently described *Tephromela talayana,* a new sorediate species that had a chemistry identical to that of the Appalachian lichen, i.e., atranorin with usnic, rangiformic and norrangiformic acids. Two paratypes borrowed from Oslo [O] proved to be a good match. These three species of *Tephromela* were all from eastern Siberia and were collected from the exposed faces of boulders in alpine habitats, very similar to the

[1]Irwin M. Brodo – Canadian Museum of Nature, P.O. Box 3443, Station 'D', Ottawa, Ontario, K1P 6P4, Canada – email: ibrodo@mus-nature.ca

habitat of the Shenandoah specimen. A new nonsorediate species, *T. perlata* Haugan & Timdal, was described from specimens in Norway and Greenland (Haugan & Timdal 1994). Like *T. talayana*, it contains rangiformic and norrangiformic acids, but it lacks usnic acid and atranorin. Several of these species of *Tephromela* were transferred to the new genus *Calvitimela* Hafellner by Hafellner, in Hafellner and Türk (2001), and others were transferred by Andreev (2003).

Materials and Methods

Specimens were examined using standard microscopic techniques with a Wild M-5 stereo dissecting microscope and a Leica DMR compound microscope. Free-hand sections were mounted in distilled water or 10% KOH.

Chemistry of the Shenandoah and CANL specimens was determined initially in Ottawa with thin layer chromatography (TLC) using methods outlined in Orange et al. (2001) in solvents A, B' and C and then verified by Chicita F. Culberson at Duke University both with TLC and high performance liquid chromatography (HPLC).

The Species

***Calvitimela talayana* (Haugan & Timdal) Andreev,** Handbook of the lichens of Russia, vol 8: 259. 2003. (Plate 2)

≡ *Tephromela talayana* Haugan & Timdal, Graphis Scripta 6: 24. 1994.

Description. – **Thallus** areolate to dispersed areolate, areolae 0.75-1.5(-2.5) mm across, convex, somewhat bullate; patches surrounded by well-developed, black, rugose prothallus. Soralia developing at edges of areolae, coarsely granular, green-black to yellowish green, forming convex to hemispherical mounds (although some soralia are excavate in the Siberian material); soredia 45-60 µm in diameter (Fig. 1). **Apothecia** very rare, not well developed, sunken into areoles, without margins, disk shiny black; epihymenium aeruginose, K+ green-brown to black at the tips, HNO_3+ red-purple; hypothecium colorless to very pale brown. No asci or spores seen. **Pycnidia** black, opening at areole surface; conidia bacilliform, length:width = 5:1, 6.8-9.4 x 1.2-1.6 µm.

Chemistry. – Atranorin and usnic acid abundant, rangiformic and norrangiformic acids, plus an additional unidentified compound (see discussion below).

Habitat. – On siliceous rocks in open tundra or rock exposures (Plate 1).

Distribution. – Eastern Siberia, arctic western Canada and montane southern Appalachian Mountains (Plate 1).

Specimens Examined. – **U.S.A. VIRGINIA**. ROCKINGHAM CO.: Shenandoah National Park, Blackrock south, 0.8 km from Blackrock parking lot on Skyline Drive, elev. 927 m, 38°13'12"N, 78°44'25"W, on quartzite rock at top of large open talus slope, 17.xi.2005, *Rock Outcrop Management Project Team (Wendy Cass et al.) 343* (CANL), *344* (U.S. National Park Service, Shenandoah Nat. Park, Luray, VA). **CANADA. NORTHWEST TERRITORIES**. Mackenzie District, North of MacKay Lake, 64°04'N, 111°03'W, in *Betula*-lichen upland tundra, 15.vi.1984, *K. Timoney s.n.* (CANL). **NUNAVUT**. Wagner Bay (near Southampton Island), 65°57'N, 91°01'W, 9.viii. 1984, *G. Scotter 77749* (CANL). **RUSSA. YAKUTIA**. OJMYAKONSKII REGION: ca. 7 km WSW of Ust'Nera, 64°32'N, 143°08'E, rocks in alpine region, 12.vii.1992, *R. Haugan & E. Timdal YAK 05/2* (O, paratype); ca. 8 km SW of Ust'Nera, 64°31'N, 143°08'E, rocks in alpine region, 23.vii.1992, *R. Haugan & E. Timdal YAK 23/1* (O, paratype).

Comparative Material of *Calvitimela perlata* (Haugan & Timdal) Andreev Examined. – **NORWAY. SØR-TRØNDELAG**. OPPDAL: Drivdalen, by the rapids in the lower part of the river Kaldvella, 62°17'N, 9°35'E, alt. 940-980 m, exposed rock face in subalpine region, 23.vii.1993, *E. Timdal 7535* (O, holotype).

Comparative Material of *Lecanora kariana* Räsänen Examined. – **FINLAND. LKSM** [?; handwriting unclear]. Kittilä, Pallastunturit, Murtovaara; ad saxa granitica, 18.vii.1925, *L.E. Kari 4* (H, holotype).

Comparative Material of *Lecanora chloroleprosa* (Vain.) H. Magn. Examined. – **SWEDEN. SMÅLAND**. Misterhult par., Jungfrun, above Lervik, 57°14'N, 16°47'E, on vertical siliceous rock facing S in rocky pine forest, 26.vii.1920, *G. Einar Du Rietz s.n. = Lichenes Selecti Exsiccati Upsalienses no. 371* (CANL).

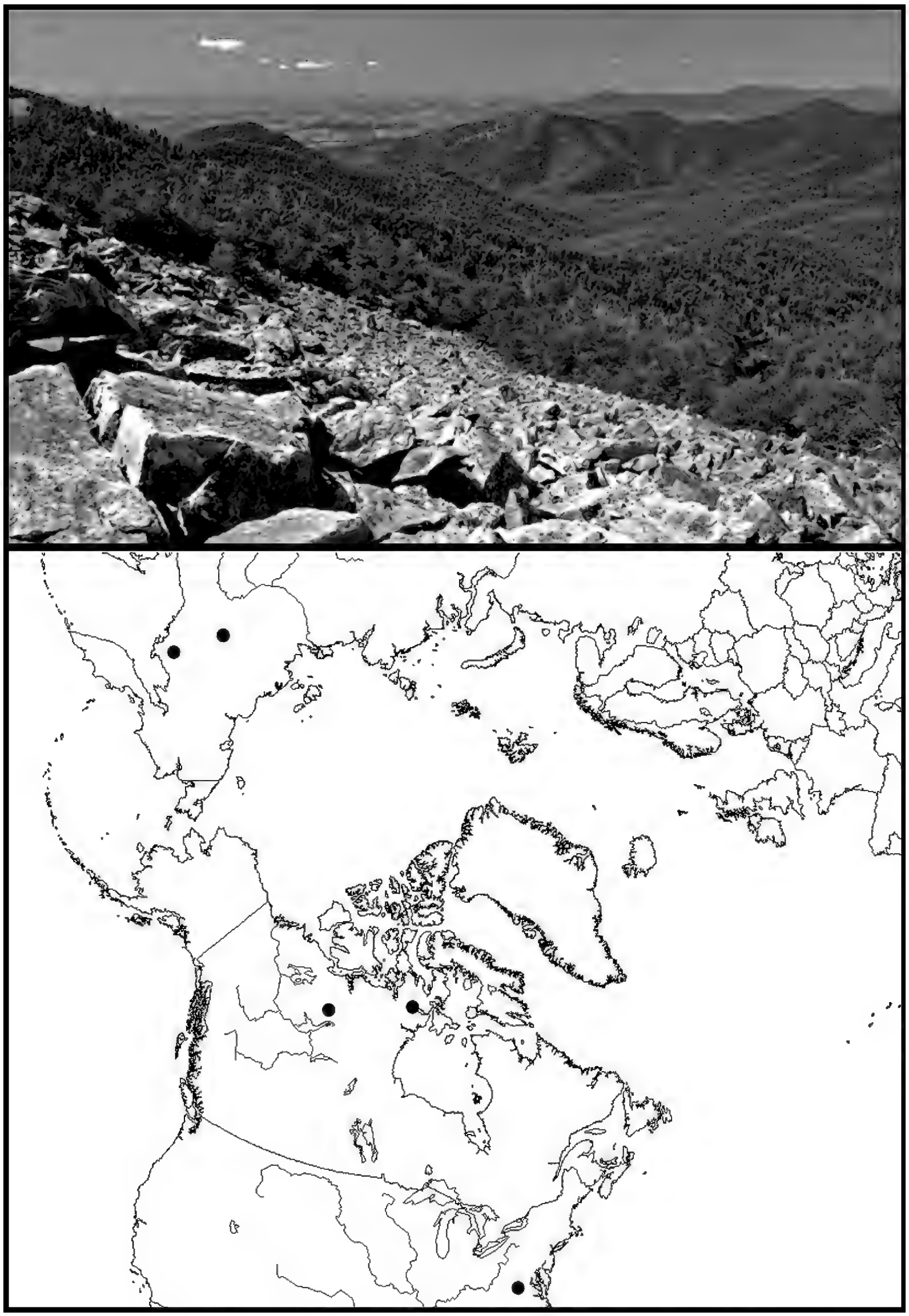


Plate 1. Above: view of Blackrock boulder field, Shenandoah National Park, where *Calvitimela talayana* was found. Below: Known world distribution of *C. talayana.*

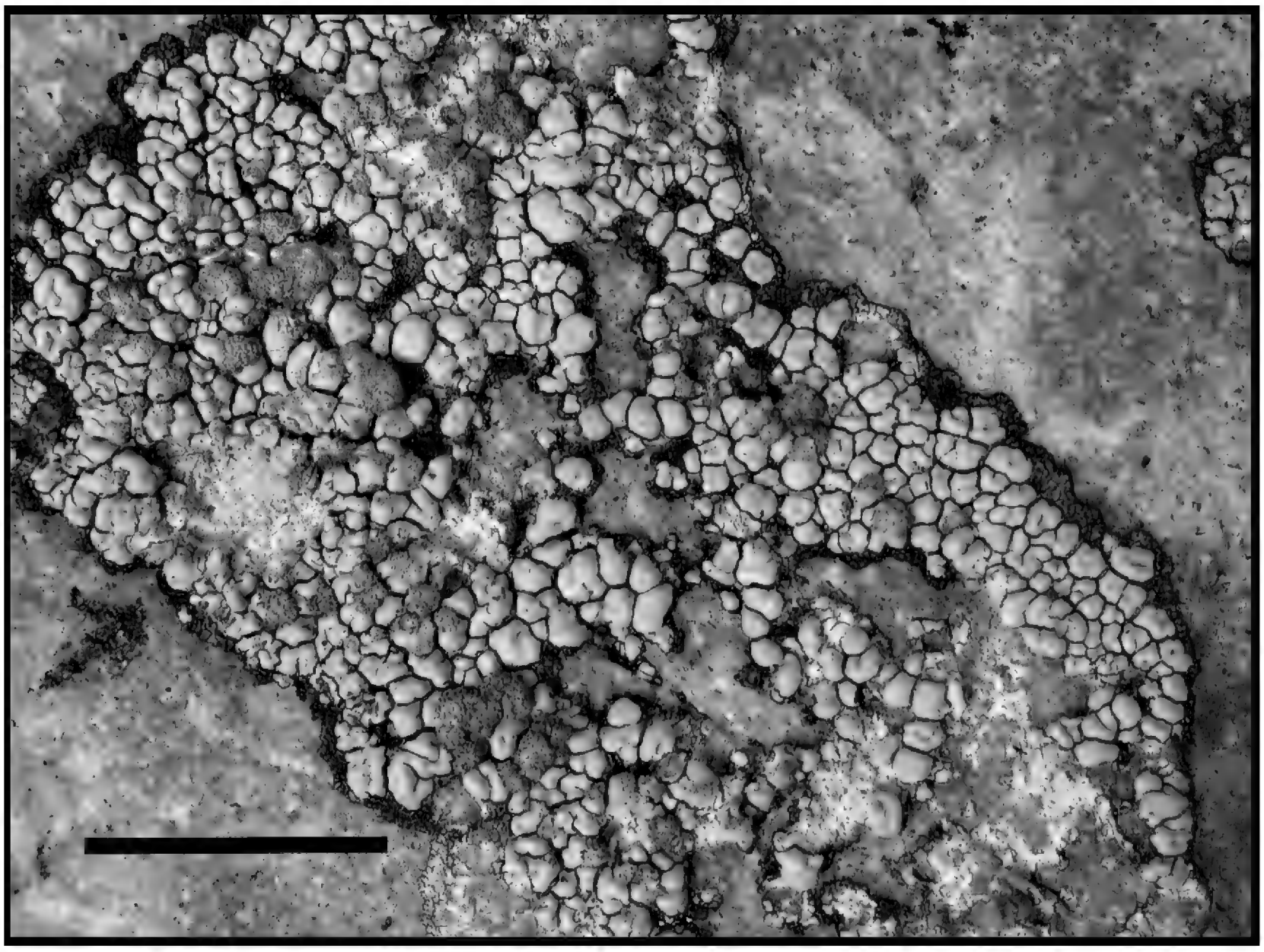


Plate 2. *Calvitimela talayana* from Shenandoah National Park (scale = 1 cm).

Results of Chemical Investigations

Although the main chemical products of *Calvitimela talayana* were confirmed by C. Culberson (pers. comm.), a question remained about the identity of the "unknown substance 1" reported by Haugan and Timdal (1994) for *Calvitimela talayana* and *C. perlata* (sub *Tephromela*) in the original descriptions of those species. *Calvitimela perlata* had an additional unknown ("no. 2") as well. Although traces of several compounds including possible pigments or depsides showed up on our chromatograms, one of them suggesting divaricatic acid, none could unambiguously be assigned to either unknown No. 1 or No. 2 or to any of the known lichen substances available to us for comparison. A test of the holotype of *C. perlata*, besides confirming the presence of rangiformic and norrangiformic acids, detected usnic acid and traces of zeorin (C. Culberson, pers. comm.), neither of which was reported by Haugan and Timdal. All these trace compounds may be due to contaminants, and they should not be considered in the chemical profiles of the species until more material becomes available for testing.

Discussion and Conclusions

Calvitimela talayana is confirmed as occurring in the southern Appalachian Mountains, Nunavut and the Northwest Territories. Based on the Virginia population, it was reported as new to North America by Hodkinson et al. (2009). The trace compounds found accompanying the main chemical products in extracts from various populations probably originate from different lichens that may have been overgrown by the *Calvitimela*.

The Virginia population of *C. talayana,* although found in an area dominated by pine-oak-heath woodland and sweet birch-chestnut oak talus woodlands typical of the mid-elevation rock exposures of the central Appalachian Mountains (Young et al. 2006, NatureServe 2008), was part of an exposed talus rock formation that is physiognomically similar to rocky alpine exposures on mountain tops of New York, New Hampshire and Maine, although the northeastern mountains are dominated by spruce and fir. It is probably a relict of an ancient panarctic or panboreal distribution that included the cooler parts of the northern

hemisphere in pre-glacial epochs. This distribution, extending down the mountain chains in the east along with the northern spruce-fir forest, was eliminated in the northeast by the continental glaciers during the Pleistocene. An almost identical disjunct distribution pattern (including the Beringian area in northern Alaska and the Yukon, Siberia, and the mountains of Honshu, Japan, disjunct to the southern Appalachian highlands) is seen with the foliose lichen, *Umbilicaria caroliniana* Tuck. (Llano 1950, Culberson 1972, Brodo et al. 2001). Among the crustose lichens, *Ropalospora lugubris* (Sommerf.) Poelt shows a somewhat wider distribution, with localities in northern Alaska, the Yukon and the Mackenzie River delta in the Northwest Territories, as well as scattered localities in Newfoundland and northern Quebec, the northern and southern Appalachians (Thomson 1997), Europe and Asia (Makarova 2004).

The Appalachians are particularly well known for their endemics and disjunctions due to their long period of availability during periods of repeated inundations and glaciations in surrounding areas since the Cretaceous (Brodo et al. 2001, Thorne 1993). This, however, applies mainly to the warm temperate Arcto-Tertiary geoflora, not the boreal and arctic vegetation, which only appeared in the Northern Hemisphere in late Miocene and Pliocene (Graham 1993). In North America, both northern Alaska and the Appalachians served as refuges for boreal species during the Pleistocene (Culberson 1972, Dey 1977). Although a few of the Southern Appalachian mountains are close to 2000 m in elevation, they do not have a true alpine zone (Dey 1978). That, and the more extensive coverage of the continental ice sheet in the east, is probably why the numerous arctic-alpine species such as *Brodoa oroarctica* (Krog) Goward, *Lecanora epibryon* (Ach.) Ach. and *Parmelia muscigena* (Ach.) Poelt, which are common in the western mountains, are infrequent in the east; and why arctic-alpine lichens like *Arctoparmelia incurva* (Pers.) Hale, *A. centrifuga* (L.) Hale and *Melanelia stygia* (L.) Essl. that reached the eastern mountains are rarely part of the Southern Appalachian flora (see maps of Thomson 1984, 1997; Brodo et al. 2001). Closer study of the higher peaks in Tennessee, Virginia and North Carolina, however, is likely to reveal additional examples, just as western arctic range extensions into the northeastern Appalachians of Maine have recently been documented through the efforts of Alan Fryday and his coworkers (Fryday 2006, Hinds et al. 2002).

Acknowledgements

Thanks go to Nick Fisichelli and Wendy Cass at Shenandoah National Park for sending me the specimen of *Calvitimela* for identification and to Richard Harris for his helpful comments on the specimen. I am indebted to Chicita Culberson for verifying the chemistry of the Shenandoah and arctic Canadian specimens in CANL, and especially for testing the chemistry of the paratypes of *C. talayana* and the holotype of *C. perlata* in an attempt to identify the unknown compounds reported for those species. I thank Einar Timdal for sending the types for examination. The distribution map was kindly produced by Noel Alfonso at the Canadian Museum of Nature. The manuscript was improved thanks to the important comments and additions of Chicita Culberson, Fenja Brodo, Robert Dirig, Mikhail Andreev, Gary Fleming and Wendy Cass. Thanks also to Gary Fleming for his photograph used in Figure 2.

Literature Cited

Andreev, M.P. 2003. Lecanoraceae. *In*: Handbook of the lichens of Russia, Vol. 8. (N. S. Golubkova, ed.) pp. 111-184. "Nauka", St. Petersburg,

Brodo, I.M., S.D. Sharnoff and S. Sharnoff. 2001. Lichens of North America. Yale University Press, New Haven, London. 795 pp.

Culberson, W.L. 1972. Disjunctive distributions in the lichen-forming fungi. Annals of the Missouri Botanical Garden, 59: 165-173.

Dey, J.P. 1977. Phytogeographic relationships of the fruticose and foliose lichens of the southern Appalachian Mountains. *In*: The distributional history of the biota of the Southern Appalachians. Part IV. Algae and Fungi. (B. C. Parker and M. K. Roane, eds.): pp. 398-416. Virginia Polytechnical Institute and State University, Research Division Monographs.

Dey, J.P. 1978. Fruticose and foliose lichens of the high-mountain areas of the southern Appalachians. The Bryologist, 81: 1-93.

Fryday, A. 2006. New North American lichen records from the alpine and sub-alpine zones of Mt. Katahdin, Maine. The Bryologist, 109**:** 570-578.

Graham, A. 1993. 3. History of the Vegetation: Cretaceous (Maastrichtian)–Tertiary. *In*: Flora of North America, Vol. 1. (Flora of North America Editorial Committee, eds.): pp. 57-70. Oxford University Press, New York and Oxford.

Hafellner, J. and Türk. 2001. Die lichenisierten Pilze Österreichs – eine Checkliste der bisher nachgewiesenen Arten mit Verbreitungsangaben. Stapfia, 76: 3-167.

Haugan, R. and E. Timdal. 1994. *Tephromela perlata* and *T. talayana*, with notes on the *T. aglaea*-complex. Graphis Scripta, 6: 17-26.

Hinds, J.W., A.M. Fryday and A.C. Dibble. 2002. Three additions to the lichen flora of North America from Mt. Katahdin, Maine. Evansia, 19: 137-141.

Hodkinson, B.P., R.C. Harris and M.A. Case. 2009. A Checklist of Virginia Lichens. Evansia, 26: 64-88.

Llano, G.A. 1950. A Monograph of the Lichen Family Umbilicariaceae in the Western Hemisphere. Navexos P-831. Office of Naval Research, Washington, D.C. 281 pp.

Makarova, I.I. 2004. Fuscidiaceae. *In*: Handbook of the Lichens of Russia, Vol. 9. (N. S. Golubkova, M. P. Andreev, E. G. Roms, eds.): pp. 10-36. "Nauka", St. Petersburg.

NatureServe. 2008. U.S. National Vegetation Classification. Shenandoah National Park. NatureServe Central Databases. Arlington, VA. Data current as of 11 March 2008.

Orange, A., P.W. James and F.J. White. 2001. Microchemical methods for the identification of lichens. British Lichen Society.101 pp.

Thomson, J.W. 1984. American arctic lichens 1. The macrolichens. Columbia University Press, New York. 504 pp.

Thomson, J.W. 1997. American arctic lichens 2. The microlichens. University of Wisconsin Press, Madison. 675 pp.

Thorne, R.F. 1993. 6. Phytogeography. *In*: Flora of North America, Vol. 1. (Flora of North America Editorial Committee, eds.): pp. 132-153. Oxford University Press, New York and Oxford.

Young, J., G. Fleming, P. Townsend, and J. Foster. 2006. Vegetation of Shenandoah National Park in relation to environmental gradients. Final Report v.1.1. Research technical report prepared for USDI, National Park Service. USGS/NPS Vegetation Mapping Program. 92 pp. plus appendices.

Opuscula Philolichenum, **7**: 7-12. 2009.

Arthonia rubrocincta: belated validation of a name for a common species endemic to *Sabal palmetto* in the southeastern United States

Martin Grube[1] & James C. Lendemer[2]

ABSTRACT. – The name *Arthonia rubrocincta* is validated more than a century after it was proposed by George K. Merrill. The species, a member of the *A. cinnabarina* group, is restricted to the leaf bases of *Sabal palmetto* in the southeastern United States.

Introduction

Even people who do not pay much attention to crustose lichens are sometimes attracted by the aesthetics of particularly conspicuous species. These gems of lichen symbioses can form complicated fruiting body shapes or brilliant pigments. Both are characteristic for taxa assigned to a complex of corticolous species collectively referred to as the *Arthonia cinnabarina* group. The species usually produce crimson to violet-red pigments, which accumulate at the margins or the surface of their variably shaped fruiting bodies. For some time now we have been aware of the existence of a distinctive species of *Arthonia* on the leaf bases of *Sabal palmetto* in the southeastern coastal plain of North America. According to pigmentation and ascospore characters, this taxon is a member of the *A. cinnabarina* group. It was given the manuscript name *A. rubrocincta* by George K. Merrill in the early 20th century and distributed in his *Lichenes Exsiccati* without a description. Since that time the name has remained invalidly published due to the lack of description, and thus, one of the most common species of *Arthonia* in Florida presently lacks a validly published name. During the 18th Tuckerman Workshop, which was held in southern Florida, U.S.A., one of us (JCL) had the opportunity to collect ample fresh material of this taxon to distribute in his exsiccate. It is the imminent distribution of this material that has finally prompted us to validate Merrill's name, which has languished in the herbarium for more than a century.

Materials and Methods

This study is limited primarily to herbarium specimens held by The New York Botanical Garden (NY), although we searched for additional records from outside of Florida in the herbaria of Duke University (DUKE) and Bell Museum of Natural History, University of Minnesota (MIN). Specimens were studied dry using a Bausch & Lomb StereoZoom 7 dissecting microscope. Microscopic characters were measured in water with an Olympus BX51 compound microscope, and images were captured using an Olympus DP20 digital camera with Microsuite Special Edition. Illustrations were prepared in Adobe Photoshop. Measurements are based on water mounts prior to the application of 10% KOH. Chromatography was performed using solvent A following the standardized methods of Culberson & Kristinsson (1970).

[1] Martin Grube – Institute of Plant Sciences, Karl-Franzens-University, 8010 Graz, Austria. – e–mail: martin.grube@uni-graz.at

[2] James C. Lendemer – Cryptogamic Herbarium, Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY, 10458–5126, U.S.A. – e–mail: jlendemer@nybg.org

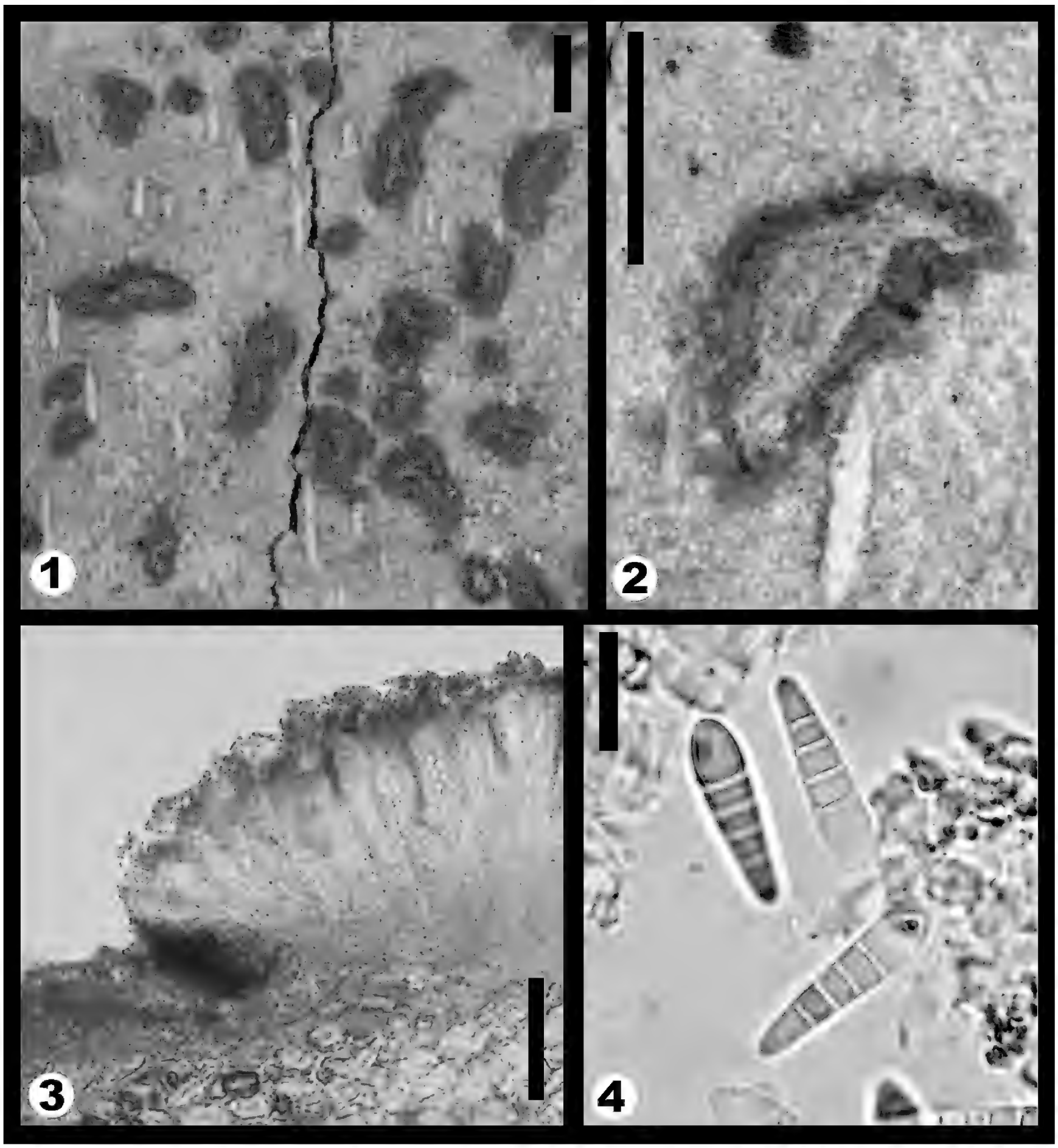


Plate 1. *Arthonia rubrocincta*, all from holotype. Figure 1, thallus and ascomata (scale = 0.5mm). Figure 2, detail of ascoma (scale = 0.5mm). Figure 3, section of ascoma illustrating position of excipular pigment (scale = 100µm). Figure 4, ascospores (scale = 10µm).

The New Species

***Arthonia rubrocincta* G. Merr. *ex* Grube & Lendemer sp. nov.**
MycoBank #514027.

Species A. fallaci et A. cinnabarinae similis, sed differt ascomatibus elongatis, furcatis, sessilibus et sporis angustioribus, 18-23 x 5-6 µm.

TYPE: **U.S.A. FLORIDA**. COLLIER CO.: Fakahatchee Strand State Preserve, vicinity of Ranger Station, disturbed roadside vegetation and shaded swampy hardwood forest, on petioles of *Sabal palmetto*, 4.iii.2009, *J.C. Lendemer 15506* (NY, holotype; isotypes to be distributed as *Lich. East. N. Amer. Exs. VIII: 351*).

Description. – **Thallus** greenish grey to white, usually endophloeodic and therefore with a smooth surface, occasionally with efflorescence of reddish crystals, effuse, occasionally with brown prothallus lines; algal layer (22)-25-(28) µm thick. **Phycobiont** *Trentepohlia*; cells (10)-13-(15) x (9)-12 µm, in short branched chains. **Ascomata** dispersed, elongate to furcate, with more or less straight branches and acute tips, ~0.7-2.5 x 0.12-0.25 mm, in section ~100-130 µm thick, sessile, with more or less flattened, reddish brown to white-pruinose surface, always with crimson pruina on the excipuloid layer. **Excipuloid** layer composed of branched and anastomosing hyphae, 2-4 µm wide; cells usually with brown walls, densely incrusted by crimson crystals. **Epithecium** pale brownish, 10-20 µm thick, hydrophobic, with more or less free hyphal tips. **Hymenium** hyaline, 50-60 µm thick. **Hypothecium** reddish brown, 60-70 µm thick; hyphal structures similar to that of *A. cinnabarina*. Interascal filaments branched and anastomosing; cells ~1-2 µm thick. **Asci** more or less densely arranged, clavate, 54-65 x 18-21 µm, 8-spored, indistinctly stipitate, lateral endotunica thin. **Ascospores** narrowly obovate, macrocephalic, 18-23 x 5-6 µm, persistently hyaline, smooth, faintly verrucose when old; with (3)-4 transverse septa, not constricted at the septa; septation sequence proceeding downwards from the upper third. **Pycnidia** ± globose, ~60 µm in diameter; pycnospores bacilliform, hyaline, 6-7 x 1 µm.

Life form. – Lichen-forming.

Chemistry. – Psoromic acid and a quinoid pigment (CIN-1[3]). Spot tests: K-, C-, KC-, P+ yellow, UV-; pigment K+ flash of violet-purple, quickly dissolving. Outer wall of thallus hyphae yellowish in diluted IKI (0.25%) and IKI (1%), bluish after K pretreatment. Ascomatal gels bluish in diluted IKI, dark blue in IKI, and after K pretreatment. Asci lacking hemiamyloid structures. Basal layers of pycnidia bluish in IKI after K pretreatment.

Distribution and Ecology. – At present *Arthonia rubrocincta* is known only from Florida and adjacent coastal Georgia where it occurs commonly on the old leaf bases of *Sabal palmetto*. Although other species of *Arthonia* also commonly occur on this substrate, *A. rubrocincta* appears to be restricted to this ecological niche. The bright crimson red ascomata of this taxon automatically draw one's attention to it in the field, and as such, it is likely that its distribution as presently known is "real" and not the result of the collection bias that normally obscures knowledge of crustose lichens.

Discussion. – *Arthonia rubrocincta* is closely related to *A. cinnabarina* (DC.) Wallr. It is distinguished from that species by its narrow ascospores, the production of psoromic acid, and ascomata that are distinctly elongated to furcate (usually with relatively short and straight branches). As was noted in the introduction, *A. cinnabarina* s.l. is actually a complex of closely related species. Representatives of this complex are widespread in tropical and subtropical latitudes, but few species are easily recognizable by phenotypic characters or substrate preferences.

---

[3] TLC of several specimens indicates the presence of only one reddish pigment termed CIN-1 (Rf classes A:6, B':4, C:6, G:5-6), which is also one of the 5 different pigments potentially present in *A. cinnabarina.* Analyses of pigments from mycobiont cultures of the latter species indicate that the reddish pigments represent isofuranonaphthoquinones (Yamamoto *et al.* 2002).

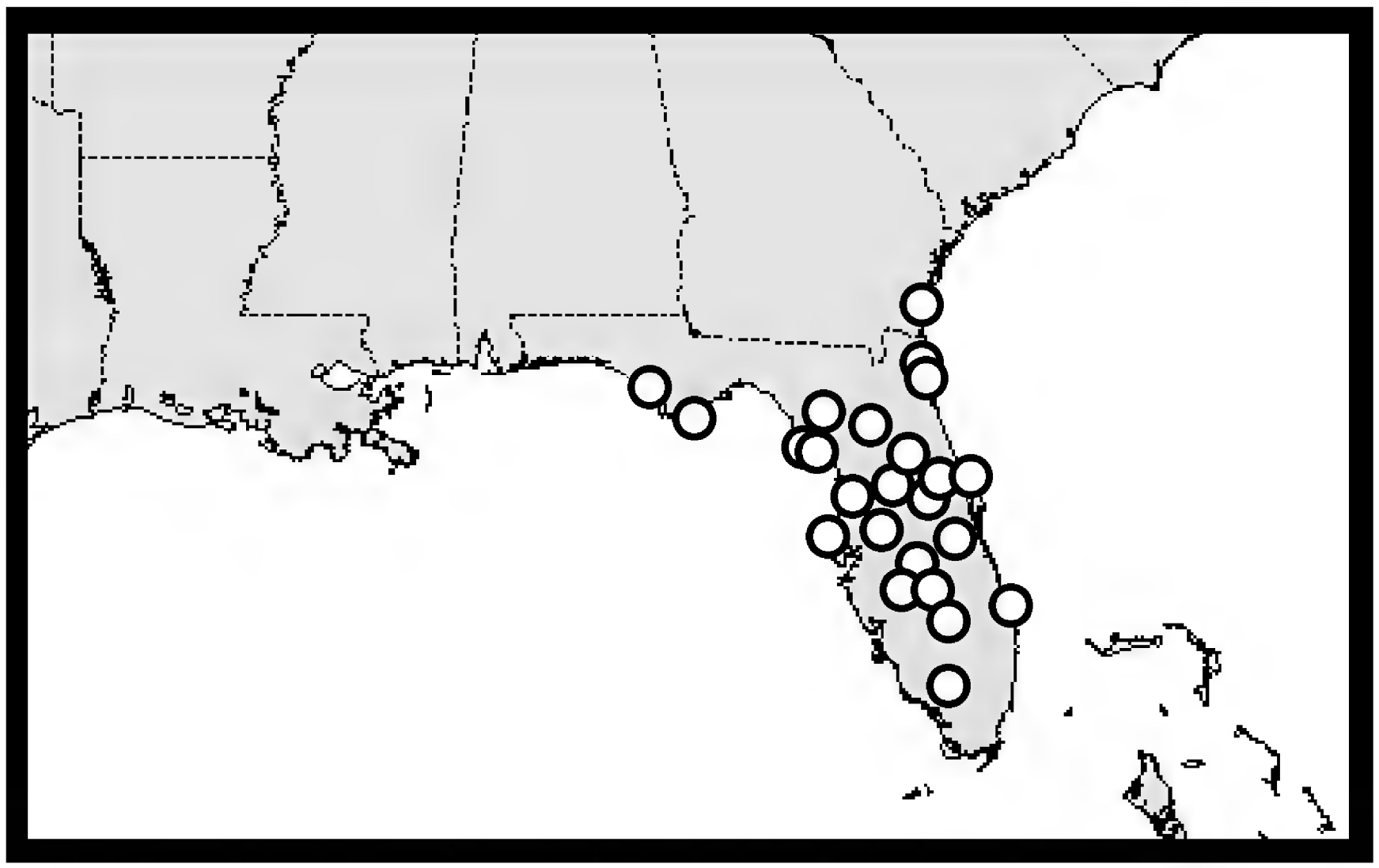


Plate 2. Geographic distribution of *A. rubrocincta* in North America as presently known.

In addition to *Arthonia cinnabarina* s. str., two other members of the species complex that *A. rubrocincta* could be confused with are *A. speciosa* (Müll. Arg.) Grube and *A. redingeri* Grube. The former taxon is geographically widespread and also has elongate ascomata, but the branches of the ascomata are more undulating than in *A. rubrocincta*, the asci have a hemiamyloid ring structure (absent in *A. rubrocincta*), and the thallus is P- due to the absence of psoromic acid. *Arthonia redingeri* is so far known only from Baja California, Mexico and can also be distinguished from *A. rubrocincta* by its P- thallus as well as its convex ascomata with a uniform crimson pruina, and ascospores that soon become brown-walled. *Arthonia ochrocincta* Nyl. ex Willey, with differently shaped ascomata (roundish to spot-like, with irregular to star-like clefts) and shorter ascospores, has been included in the checklist of North American lichens (Esslinger 2008), but is only known with certainty from the type collection from Cuba. Unfortunately the type collection of *A. ochrocincta* consists of limited material and chemical studies could not be performed to determine if psoromic acid is present. We suggest that *A. ochrocincta* should be removed from the North American checklist pending further study.

We believe the differences in chemisty, ascoma morphology, and ascospore size suggest that *Arthonia rubrocincta* represents a genetically distinct lineage within the *A. cinnabarina*-complex that has evolved in geographic isolation and is clearly worthy of taxonomic recognition. Field observations of *A. cinnabarina* s.l. suggest that some morphotypes, distinguished from other taxa in the complex by subtle characters, have highly localized distributions. The correlation between these characters strongly suggests that such morphotypes could represent genetically distinct lineages that should be recognized taxonomically.

Selected Specimens Examined. – **U.S.A. FLORIDA**. ALACHUA CO.: Paynes Prairie State Preserve, 1.xii. 1992, *R.C. Harris 29470* (NY). BAY CO.: St. Andrews State Recreation Area, 16.viii.1985, *S.C. Tucker 27138* (NY). BREVARD CO.: Merritt Island National Wildlife Refuge, 5.i.1996, *R.C. Harris 37224* (NY). CITRUS CO.: St. Martins Marsh Aquatic Preserve, 5.xii.1996, *W.R. Buck 31320* (NY). DIXIE CO.: Steinhatchee Wildlife Management Area, Pumpkin Swamp, 4.xii.1993, *R.C. Harris 31511* (NY). DUVAL CO.: Atlantic Beach, Pine Island, 26.xi.2006, *W.R. Buck 51161* (NY). FRANKLIN CO.: St. George Island State Park, 1.xii.1988, *W.R. Buck 16570* (NY). GLADES CO.: Tom Gaskin's Cypress Catwalk, 30.iii.1998, *W.R. Buck 34115* (NY); Ortona Cemetery, 6.iii.2009, *J.C. Lendemer 15730* (NY). HARDEE CO.: Zolfo Springs, 29.iii.1998, *W.R. Buck 34003* (NY). HENDRY CO.: Okaloacoochee Slough State Forest, 6.iii.2009, *J.C. Lendemer 15770* (NY). HIGHLANDS CO.: Highlands Hammock State Park,

11.viii.1985, *R.C. Harris 18120* (NY). HILLSBOROUGH CO.: Hillsborough River State Park, 3.xii.1992, *W.R. Buck 22619* (NY). LAKE CO.: Eustis, 1898, *R. Thaxter 381* (NY). LEVY CO.: Cedar Key Scrub State Preserve, 30.xi.1992, *R.C. Harris 29362* (NY). MARION CO.: Ocala National Forest, 2.2 mi N SR 40 on SR 19, 2.i.1996, *W.R. Buck 28810* (NY). MARTIN CO.: Jonathan Dickinson State Park, 25.iii.1998, *W.R. Buck 33598* (NY). MIAMI-DADE CO.: Matheson's Hammock, 11.xii.1919, *N.L. Britton 810 & E.G. Britton* (NY). NASSAU CO.: Fernandina Beach, 16.xii. 1987, *W.R. Buck 15470* (NY). ORANGE CO.: Tosohatchee State Reserve, 7.i.1996, *W.R. Buck 29107* (NY). OSCEOLA CO.: Bull Creek Wildlife Management Area, 9.i.1996, *W.R. Buck 29161* (NY). PINELLAS CO.: Clearwater, ii.1937, *C.S.R.* s.n. (NY). POLK CO.: Nalcrest, 11.iii.1989, *E.M. Wheeler s.n.* (NY). SEMINOLE CO.: Black Hammock near Oviedo, 27.viii.1977, *T. Ahti 34295* (NY). SUMTER CO.: Withlacoochee State Forest, 5.xii. 1996, *R.C. Harris 39828-A* (NY). VOLUSIA CO.: Blue Spring State Park, 23.iii.1998, *W.R. Buck 33491* (NY); Daytona, 1911, *G.K. Merrill s.n. = Lich. Exs. no. 148* (COLO, DUKE, NY, US). **GEORGIA**. GLYNN CO.: Fort Frederica National Monument, 3.xii.1989, *C.M. Wetmore 65718* (NY).

Acknowledgements

We sincerely thank Richard Harris for helpful discussions and aid in the preparation of the plates. We also thank Irwin Brodo and Rick Seavey for reviewing the manuscript. Fieldwork carried out by the second author (JCL) that generated specimens used in this study was made possible through the generous support of The New York Botanical Garden.

Literature Cited

Esslinger T.L. 2008. A cumulative checklist for the lichen–forming, lichenicolous and allied fungi of the continental United States and Canada. North Dakota State University: http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm (First Posted 1 December 1997, Most Recent Version (#14) 8 October 2008), Fargo, North Dakota.

Culberson, C.F., and H. Kristinsson. 1970. A standardized method for the identification of lichen products. Journal of Chromatography, 46: 85–93.

Yamamoto, Y., Y. Kinoshita, G.R. Thor, M. Hasumi, K. Kinoshita, K. Koyama, K. Takahashi, and I. Yoshimura. 2002. Isofuranonaphthoquinone derivatives from cultures of the lichen *Arthonia cinnabarina* (DC.) Wallr. Phytochemistry 60: 741–745.

Opuscula Philolichenum, **7**: 13-16. 2009.

Verrucaria thujae (Verrucariaceae, Lichenized Ascomycetes), a new corticolous species from the Great Lakes Region of North America

James C. Lendemer[1] & Othmar Breuss[2]

ABSTRACT. – *Verrucaria thujae*, a new corticolous species from the Great Lakes Region of North America, is described.

Introduction

Corticolous members of the large and taxonomically complex genus *Verrucaria* Ach. are relatively rare in North America, with only four species having been reported to date (Breuss 2002, 2008). These species are easily recognized because no other crustose pyrenocarpous corticolous lichens with simple ascospores are known to occur on the continent. Recently, while determining unidentified material in the herbarium of The New York Botanical Garden (NY) we discovered a corticolous *Verrucaria* species from northern Michigan that did not match any previously described taxon (Breuss 1998). Further study confirmed that the material represented a species new to science, and we describe it here as *Verrucaria thujae*.

Materials and Methods

The specimen was studied dry using a Baush & Lomb StereoZoom 7 dissecting microscope. Microscopic characters were measured in water with an Olympus BX51 compound microscope and images were captured using an Olympus DP20 digital camera with Microsuite Special Edition. Illustrations were prepared using Adobe Photoshop. Sections of the thallus and apothecia were prepared by hand cutting with a razor blade and mounted in water. Measurements are based on water mounts. Chromatography was not performed because of the small size of the specimen and because of the absence of lichen substances in the Verrucariaceae.

The New Species

***Verrucaria thujae* Lendemer & Bruess sp. nov.**

Mycobank #515301.

Species corticola. Thallus virenti-brunneus, minute granulosus vel subsquamulosus. Perithecia subglobosa, fere sessilia sed strato thallino tenuiter tecta. Excipulum praeter partem apicalem incoloratum, involucrello nullo. Ascosporae ellipsoideae, c. 17-21 x 6-8 µm.

TYPE: **U.S.A. MICHIGAN**. CHEBOYGAN CO.: Reese's Bog, W of Roberts Road, 1 mi S of Riggsville Road (Hwy C64) on East Burt Lake Road and Roberts Road, 45°32'41"N 84°39'46"W, *Thuja*-dominated swamp, on base of *Thuja*, 13.vii.2002, *W.R. Buck 42020* (NY!, holotype).

[1] James C. Lendemer – Cryptogamic Herbarium, Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY, 10458–5126, U.S.A. – e–mail: jlendemer@nybg.org

[2] Othmar Breuss – Department of Botany, Naturhistorisches Museum Wien, Burgring 7, A-1010 Wien, Austria – e–mail: obreuss@bg9.at

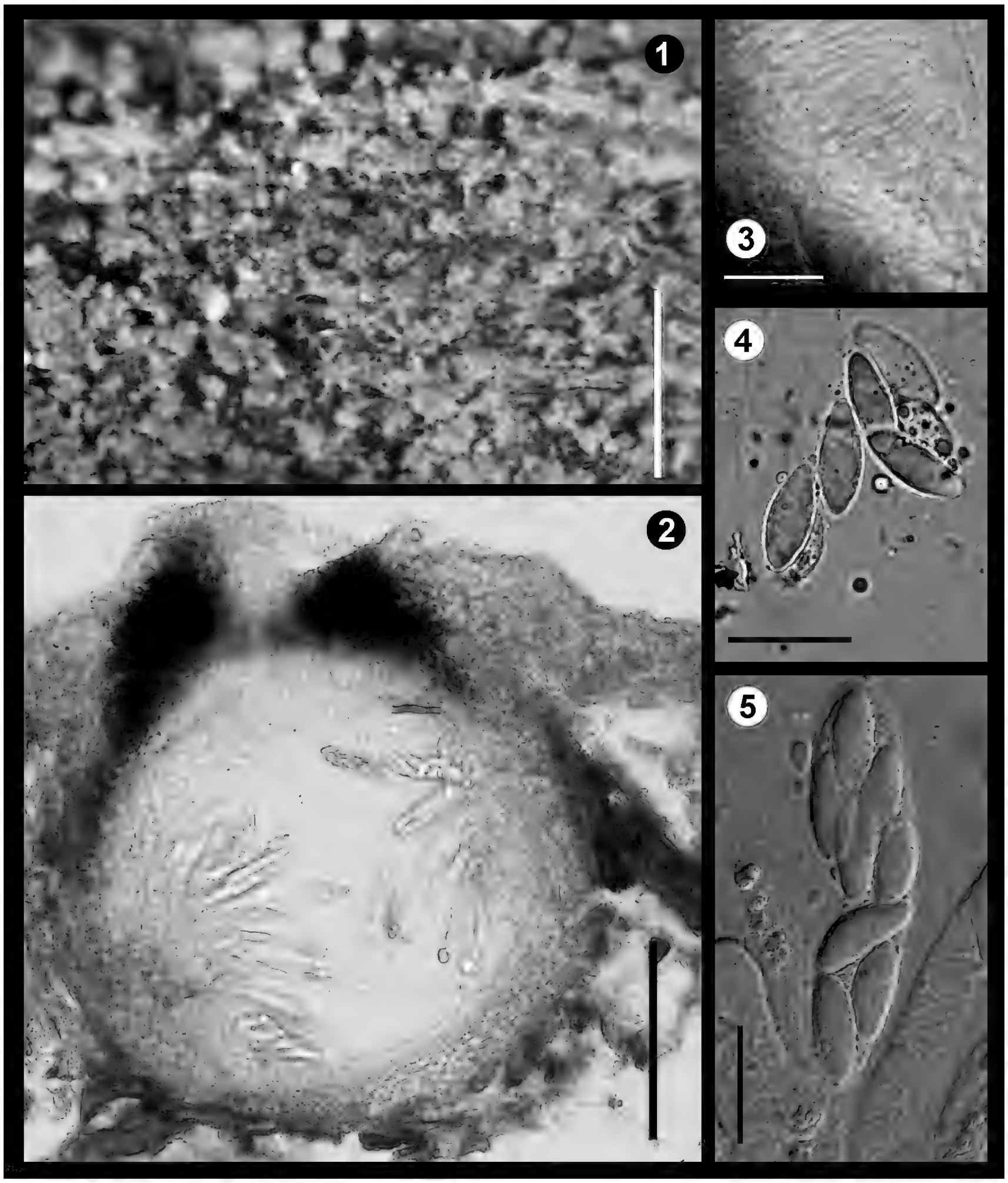


Plate 1. *Verrucaria thujae* (all from holotype). Figure 1, thallus and perithecium (scale = 0.5 mm). Figure 2, section of perithecium (scale = 100 µm). Figure 3, periphyses (scale = 20 µm). Figures 4-5, ascus and ascospores (scale = 20 µm).

DESCRIPTION. – **Thallus** corticolous, greenish brown, irregularly verruculose to microsquamulose with the thalline units eventually overlapping and aggregated into small heaps in the older portions of the thallus, often with a thin poorly developed prothallus of hyaline hyphae; **verrucae /microsquamules** with a paraplectenchymatous pseudocortex often composed of only a single layer of hyaline hyphae (~3-5 µm wide); **perithecia** nestling amongst the irregularities of the bark surface, projecting from the thallus layer, finally appearing superficial, although actually covered with a thin layer of thallus giving the appearance of a film covering the perithecium, ~300-350 µm in diameter; **exciple** distinctly cellular, 20-30 µm wide, hyaline below, often thicker and transitioning to dark brown/brownish black-pigmented near the ostiole; **involucrellum** lacking; **periphyses** hyaline, septate, ~25 x 1.5 µm; **asci** clavate, ~60-90 x 20-30 µm; **ascospores** narrowly ellipsoid, hyaline, 8/ascus, (17)-*19.2*-(21.4) x (6.2)-7.0-(7.8) µm (*n* = 20; average +/- 1 SD).

ETYMOLOGY. – The epithet "thujae" denotes the substratum of the type collection, *Thuja occidentalis* L. (Cupressaceae), a distinctive species of the northern boreal forests of the Michigan Straits Region.

DISTRIBUTION AND ECOLOGY. – The new species was found growing over mosses and bark at the base of *Thuja occidentalis* and is only known from the type collection. It is likely to be more widespread in the vicinity of the type locality and throughout the geographic range of *T. occidentalis* but overlooked because of its small size.

DISCUSSION. – The most characteristic features of the new species are the granulose to microsquamulose thallus, the absence of an involucrellum, the pale exciple, the thalline cover on the perithecia up to their apices, and medium-sized ascospores. Other *Verrucaria* species known to occur on bark or wood and lacking an involucrellum differ in having dark exciples and different spore sizes. For comparison, a key to the known corticolous and lignicolous species of *Verrucaria* is included below (see Appendix I).

ACKNOWLEDGEMENTS

Thanks to Richard Harris for assistance with the illustrations. Also thanks to Patrick McCarthy and Alan Orange for reviewing the manuscript.

LITERATURE CITED

Breuss, O. 1998. Drei neue holz- und borkenbewohnende *Verrucaria*-Arten mit einem Schlüssel der bisher bekannten Taxa. Linzer Biologische Beitrage, 30(2): 831-836.

Breuss, O. 2002. Four *Verrucaria* species new to America. Evansia, 19(1): 26-28.

Breuss, O. 2008. *Verrucaria*. *In*: Nash III, T.H., C. Gries & F. Bungartz (eds). Lichen Flora of the Greater Sonoran Desert Region, Volume 3, pp. 335-377. Arizona, Tempe: Lichens Unlimited.

Pykälä, J. 2008. Additions to the lichen flora of Finland. III. Graphis Scripta, 20: 19-27.

Pykälä, J. and O. Breuss. 2009. Six rare *Verrucaria* species new to Finland. Österreichische Zeitschrift für Pilzkunde, 18 (in press).

APPENDIX I – KEY TO CORTICOLOUS AND LIGNICOLOUS SPECIES OF VERRUCARIA

Updated key to the corticolous and lignicolous species of *Verrucaria* based on Breuss (1998) with additions from recent papers by Pykälä (2008) and Pykälä & Breuss (2009). Species presently known to occur in North America are printed in bold.

1. Ascospores short, 8-12 x 6-8 µm; perithecia between the thallus areoles.....*V. epixylon* Zsch.
1. Ascospores longer, >12 µm; perithecia various.....2
   2. Thallus composed of goniocysts, vividly green; involucrellum absent; exciple black; ascospores 20-25(-27) x 7.5-9 µm..... ***V. viridigrana*** **Breuss**

2. Thallus continuous or composed of irregular, coarse granules or areole like units……..3
3. Involucrellum present……4
4. Involucrellum fully surrounding perithecium……5
5. Ascospores 20-22 x 9-10 µm; involucrellum continuous……*V. truncigena* Breuss
5. Ascospores 25-30 x 9-11 µm; lowermost part of involucrellum sometimes reduced to fleck-like blackenings……*V. ulmi* Breuss
4. Involucrellum lacking below……6
6. Involucrellum present on the upper 1/3-2/3 of the perithecium…… 7
7. Ascospores 20-30 x 10-14 µm; on sporadically inundated wood…… *V. litorea* (Hepp) Zsch.
7. Ascospores 24-28 x 11-13 µm; on dry bark…… ***V. quercina* Breuss**
6. Involucrellum reaching down to exciple base-level……8
8. Involucrellum fully appressed to the exciple throughout……9
9. Species on burnt wood; basal opening of involucrellum obvious; exciple pale; ascospores 12-17 x 6-7 µm…… ……*V. carbonella* Nyl. *ex* Hulting
9. Species on bark; basal opening of involucrellum not always obvious; exciple darkening; ascospores 14-18 x 5-7 µm……*V. corticola* Servít
8. Involucrellum appressed in upper part, slightly diverging from the exciple at the base……10
10. Thallus very thin and inconspicuous, whitish or gray……..11
11. Ascospores narrowly ellipsoid, 24-29 x 8-10 µm……*V. tuerkii* Breuss
11. Ascospores broad, 26-32 x 14-16 µm……*V. arboricola* Zahlbr.
10. Thallus thicker, greenish or grayish brown to blackish……12
12. Exciple dark; ascospores 16-24 x 10-13 µm……*V. lignorum* Servít
12. Exciple pale……13
13. Ascospores 15-20 x 7-9 µm; exciple 0.10-0.15 mm wide; on bases and exposed roots of trees on shores of brooks and lakes…… ……*V. lignicola* Zsch.
13. Ascospores larger; exciple wider; on dry bark……14
14. Ascospores 19-23 x 9-12 µm……***V. trabicola* Arnold *ex* Servít**
14. Ascospores 23-29 x 12-16 µm…… *V. sorbicola* Servít
3. Involucrellum absent or indistinguishable from the dark exciple……15
15. Exciple soon black throughout (only in young perithecia pale at the base)……16
16. Ascospores 14-19 x 6-8 µm; exciple 0.15-0.20 mm wide……*V. hegetschweileri* Körb.
16. Ascospores 25-30 x 12-14 µm; exciple 0.20-0.30 mm wide……***V. phloeophila* Breuss**
15. Exciple persistently pale at least in lower part of perithecium……17
17. Exciple pale except for the apex; perithecium almost sessile, covered with a thin layer of thallus; ascospores 17-21 x 6-8 µm……***V. thujae* Lendemer & Breuss**
17. Exciple dark at least in upper half; perithecium immersed to semi-immersed, without distinct thalline cover……18
18. Ascospores 18-26 x 10-13 µm……19
19. Thallus thin, greenish gray; on bark…… *V. sorbinea* Breuss
19. Thallus thick, grayish brown; on lignum…… *V. kondaensis* Vain.
18. Ascospores smaller: 15-23 x 7-10 µm……20
20. Exciple 0.10-0.15 mm wide; thallus thin; ascospores 15-23 x 7-10 µm…… ……*V. saepincola* Vain.
20. Exciple (0.15-)0.20-0.25 mm wide; thallus thicker; ascospores 16-22 x 8-10 µm……*V. trabalis* Nyl.

Opuscula Philolichenum, **7**: 17-20. 2009.

Carnegieispora rimeliae, a new genus of lichenicolous fungus from the Azores

JAVIER ETAYO[1] & FRANZ BERGER[2]

ABSTRACT. – The new lichenicolous coelomycete genus *Carnegieispora*, with the single species *C. rimeliae* are described. The grey and branched conidia that develop in acervular structures are characteristic. The type host is *Parmotrema reticulatum*, collected on São Miguel Island in the Azores archipelago (Portugal).

INTRODUCTION

During our studies of lichenicolous fungi in Macaronesia, the second author collected an undescribed lichenicolous coelomycete on a bleached thallus of *Parmotrema reticulatum* (Taylor) M. Choisy. As no genus with such peculiar conidia in combination with open conidiomata that are similar to acervuli was previously known, the new genus *Carnegieispora* is proposed.

The diversity of lichenicolous fungi is under-represented in the fast growing checklist of lichens and lichenicolous fungi of the Azores. Only 22 species were mentioned from there at the turn of the millennium (Hafellner 1995, 1999, 2002). Fifteen species were added by Berger and Aptroot (2002) and Berger and Priemetzhofer (2008) reported another 30 as a result of a two-week field trip. These numbers suggest that more species might be discovered in the near future on this archipelago.

MATERIALS AND METHODS

Examination of anatomical structures and pigments was carried out on handmade sections and mounted in distilled water and 10% KOH (K). Digital photographs were taken with a Nikon Coolpix 5200. All microscopical measurements were made in water. Type material is deposited in LI.

THE NEW SPECIES

***Carnegieispora* Etayo & F. Berger gen. nov.**

MYCOBANK #515391.

Diagnosis and description as for the type species, *Carnegieispora rimeliae* Etayo & F. Berger, described below.

***Carnegieispora rimeliae* Etayo & F. Berger sp. nov.**

MYCOBANK #515392.

Conidiomata lichenicola, acervuli, nigra, 40-60 µm diam., setis nullis. Conidiophora subspherica 2-4 µm diam., vel elongata, 6 x 3 µm. Cellulae conidiogenae griseae, ellipsoideae, holoblasticae, annellidicae, laeves, 4-7 x 2-3 µm. Conidia grisea, levia, sicca, ramificata, simplicia vel septata, 9.5-16 µm longa, 7-10 µm lata, ramis 2-3 µm diam.

[1]JAVIER ETAYO – Navarro Villoslada 16-3° dcha, E-31003 Pamplona, Navarra, Spain – e–mail: jetayosa@pnte.cfnavarra.es

[2]FRANZ BERGER – A-4794 Kopfing 130, Austria – e–mail: flechten.berger@aon.at

TYPE: **PORTUGAL. AZORES**. São Miguel, Furnas, Jardim Botanico "Terra Nostra", on *Parmotrema reticulatum*, 220 m, 37º45.77'N, 25º18.1'W, 28.vii.2003, *F. Berger 18380* (LI, holotype; hb. Etayo, isotype).

DESCRIPTION. – *Conidiomata* immersed, black, at first pycnidial, finally breaking through the upper cortex of the host thallus by a fissure, eventually similar to acervuli, 40-60 µm diam. *Conidiophores* formed on a paraplechtenchym of subhyaline to brownish cells at the base of the conidiomata, subsphaerical, 2-4 µm diam., or elongate to 6 x 3 µm. *Conidiogenous cells* ellipsoid, holoblastic, annellidic, terminal, elongate-cylindrical, grey, smooth, with 1(-2) percurrent proliferations, 4-7 x 2-3 µm. *Conidia* arising singly, dry, acrogenous, grey, basally truncate, thin-walled, smooth, irregularly branched, branches not arranged in a single plane, overall 9.5-16 µm tall and 7-10 µm wide, with 3-4 arms; stem 0-2 septate, arms simple or rarely with 1 septum, clearly constricted at the base, 2-3 µm wide, with obtuse apex.

ETYMOLOGY. – The shape of the conidia of *Carnegieispora* reminds us of the North American saguaro cactus, *Carnegiea gigantea*. *Rimeliae* derives from the former generic name of the host, *Rimelia reticulata* (Taylor) Hale & A.Fletcher (now *Parmotrema reticulatum*).

DISTRIBUTION AND HOST. – The new fungus is known only from the type locality in Azores growing on a decolorized, damaged thallus of *Parmotrema reticulatum*. Its extremely small size makes it difficult to find it in the field.

DISCUSSION. – Most lichenicolous fungi with branched conidia belong to genera that do not include non-lichenicolous species (the latter having been treated in detail by Nag Raj (1993) and Sutton (1980)). There are six known genera of lichenicolous fungi that have species with branched conidia or stauroconidia: *Choreospora* O. Const. & R.Sant. (Constantinescu & Santesson 1987), on foliicolous lichens; *Cladoniicola* Diederich, van den Boom & Aptroot (Diederich et al. 2001), on *Cladonia*; the sporodochial genus *Lichenostella* Etayo & Calatayud (Calatayud & Etayo 1999, Etayo 2002), on *Hypotrachyna*; *Psammina* Sacc. & M. Rousseau, on diverse substrates including lichens (see key in Earland-Bennett & Hawksworth 2005); and *Cornutispora* Pirozynski, which comprises fungicolous and lichenicolous taxa (Punithalingam 2003). The genus *Cheiromycina* Sutton (Sutton & Muhr 1986, Hawksworth & Poelt 1990), is considered to be lichenized.

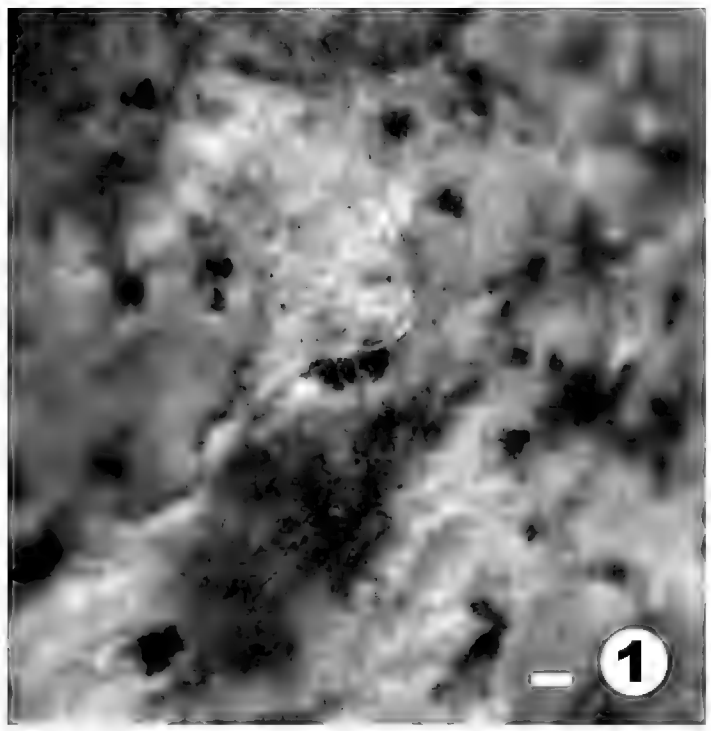
Except for the genus *Cheiromycina,* which has conidia that can be brownish in some parts, all the above genera have hyaline conidia. Although typical acervuli were not known in lichenicolous fungi, the conidiomata of *Psammina* have been described using terms that indicate a resemblance to acervuli (e.g., acervulate, acervuloid, and indeterminate to sporodochial; Earland-Bennett & Hawksworth 2005). Some of the species, even lichenicolous ones like *P. lobariae* (Diederich & Etayo) Earl.-Benn. & D. Hawksw, are similar to *Carnegieispora* but as mentioned above they differ in having hyaline conidia.

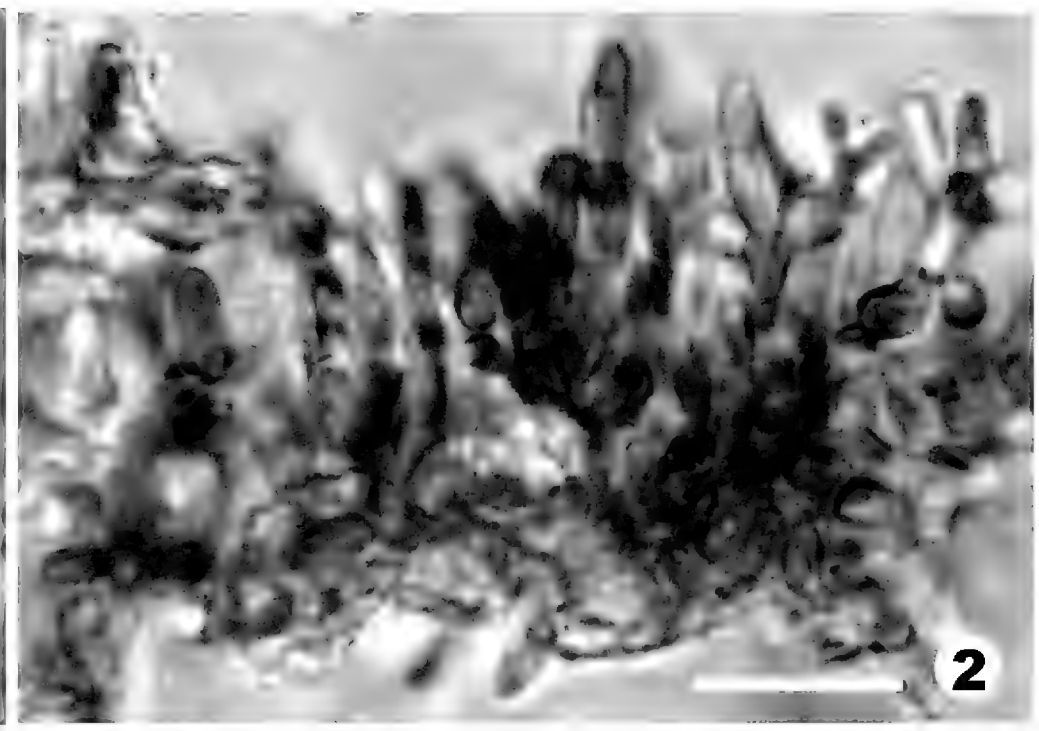
None of the above genera shares the features that we describe in *Carnegieispora*: conidia pigmented, branched and euseptate, emerging from holoblastic, broadly ellipsoid, sometimes annellidic conidiogenous cells growing on a more or less paraplechtenchymatic basal structure that in all is similar to a diminutive lichenicolous acervulus.

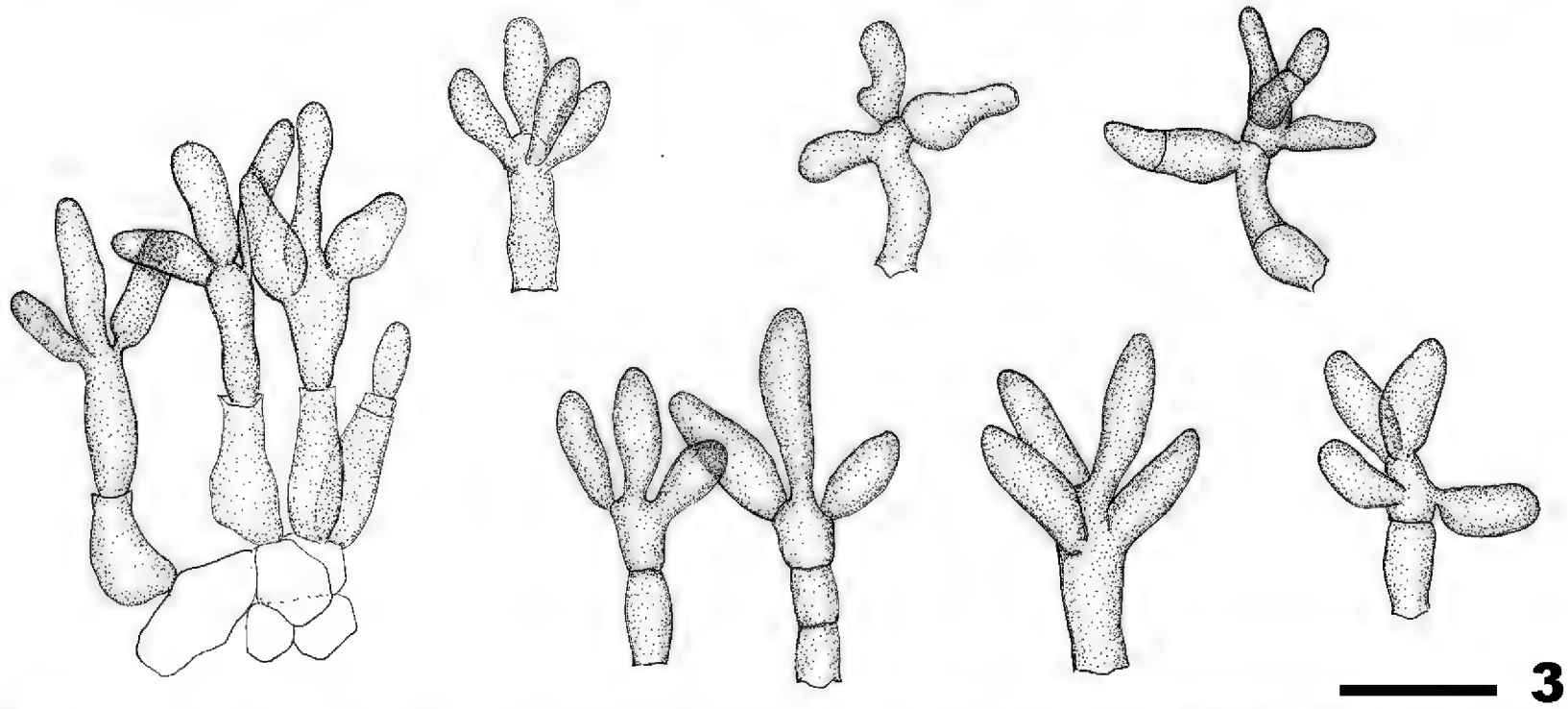
In addition to the genera discussed above, the conidia of *Carnegieispora* are similar in shape to those of the non-lichenicolous hyphomycete genus *Volucrispora* Haskins. A description of *V. ornithomorpha* (Trotter) Haskins, with similar-sized conidia, is given by Hawksworth (1976). However, the conidia in this species are colorless and simple, rarely 1-septate. Furthermore, this fungus forms white, powdery, effuse colonies on leaves (of the vascular plant *Cerastium* in the type specimen) instead of acervular conidiomata growing on lichen thalli. Another important difference are the proliferating conidiogenous cells in *Carnegieispora*, which are clearly different from those of *Volucrispora*.

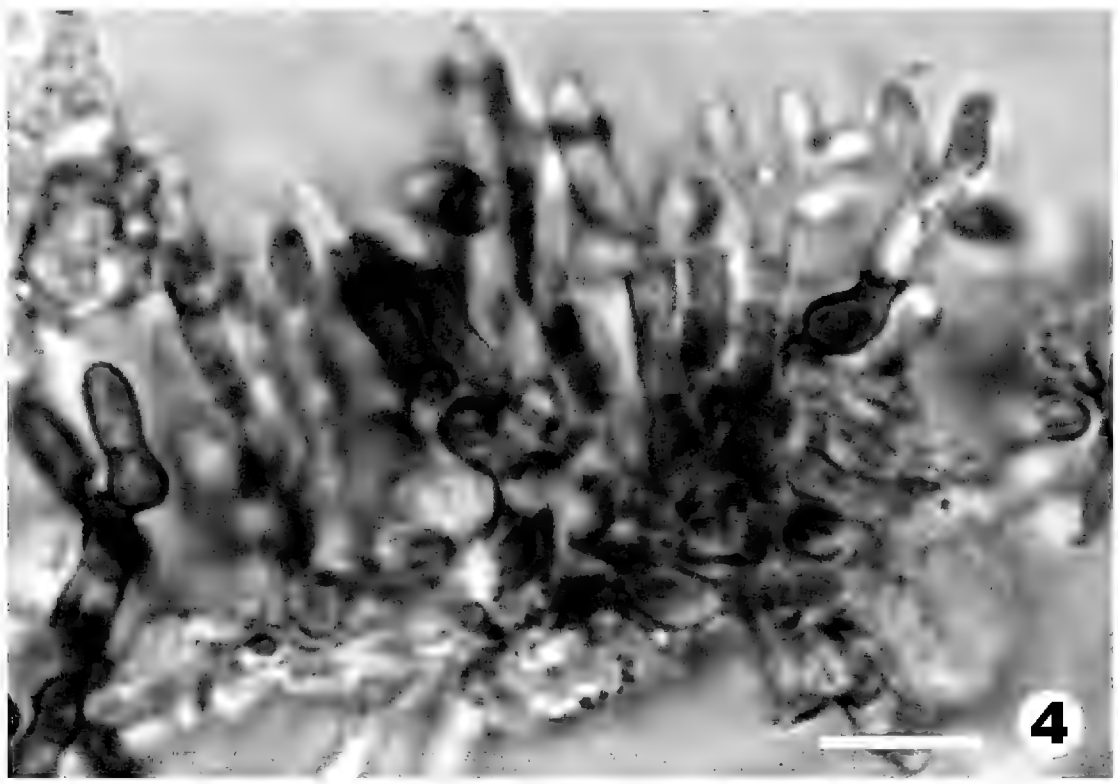
ACKNOWLEDGEMENTS

We wish to thank D.L. Hawksworth who brought our attention to the conidial similarity with the hyphomycete genus *Volucrispora*; also P. Diederich, K. Knudsen and J. Lendemer for language corrections and improvements in the edition of the manuscript.









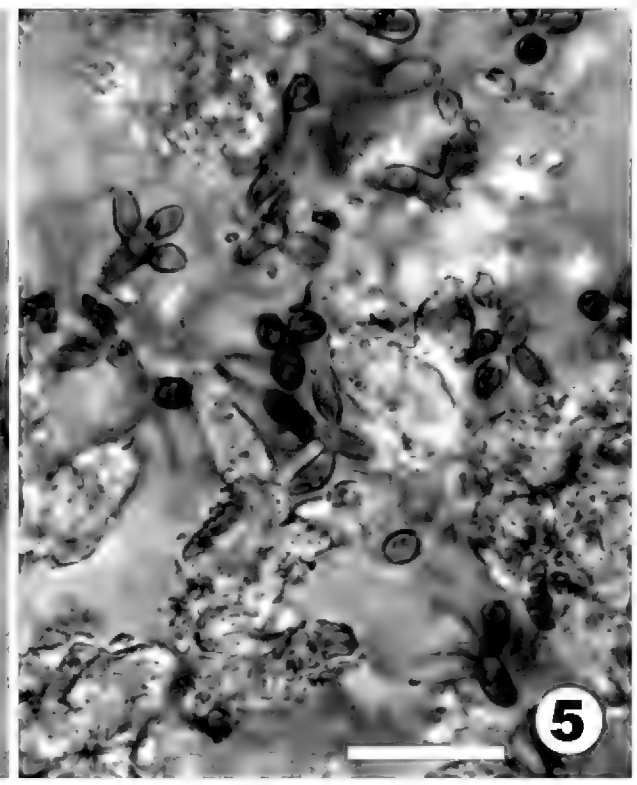


Plate 1. *Carnegieispora rimeliae*. Figure 1, acervular like conidioma on thallus of *Parmotrema reticulatum* (holotype, scale = 50 µm). Figures 2 and 5, conidiogenous cells and conidia (holotype, scale = 10 µm). Figure 3, conidiophores, conidiogenous cells and conidia (isotype, scale = 10 µm). Figure 4, branched conidia (holotype, scale = 10 µm).

Literature Cited

Berger, F. and A. Aptroot. 2002. Further contributions to the flora of lichens and lichenicolous fungi of the Azores. Arquipélago, Life and Marine Sciences, series A, 19: 1-12.

Berger, F. and F. Priemetzhofer 2008. Neufunde und interessante Nachweise von Flechten und flechtenbewohnenden Pilzen von den Azoren. Herzogia, 21: 125-146.

Calatayud, V. and J. Etayo. 1999. *Codonmyces* and *Lichenostella*, two new genera of lichenicolous conidial fungi. The Lichenologist, 31: 593-601.

Constantinescu, O. and R. Santesson. 1987. *Choreospora* gen. nov., a new lichenicolous hyphomycete from Australia. The Lichenologist, 19: 177-181.

Diederich, P., P. van den Boom, and A. Aptroot. 2001. *Cladoniicola staurospora* gen. et sp. nov., a new lichenicolous coelomycete from Western Europe. Belgian Journal of Botany, 134: 127-130.

Earland-Bennett, P.M. and D.L. Hawksworth. 2005. The first lichen-forming species of *Psammina*, *P. palmata* sp. nov., with notes on the status of *Cheiromycina* and *Pycnopsammina*. The Lichenologist, 37: 191-197.

Etayo, J. 2002. Aportación al conocimiento de los hongos liquenícolas de Colombia. Bibliotheca Lichenologica, 84: 1-154.

Hafellner, J. 1995. A new checklist of lichens and lichenicolous fungi of insular Laurimacaronesia including a lichenological bibliography for the area. Fritschiana, 5: 1–132.

Hafellner, J. 1999. Additions and corrections to the checklist and bibliography of lichens and lichenicolous fungi of insular Laurimacaronesia I. Fritschiana, 17: 1–26.

Hafellner, J. 2002. Additions and corrections to the checklist and bibliography of lichens and lichenicolous fungi of insular Laurimacaronesia II. Fritschiana, 36: 1–10.

Hawksworth, D.L. 1976. New and interesting microfungi from Slapton, south Devonshire: Deuteromycotina III. Transactions of the British Mycological Society, 67: 51-59.

Hawksworth, D.L. and J. Poelt. 1990. A second lichen-forming species of *Cheiromycina* from Austria. The Lichenologist, 22: 219-224.

Naj Raj, T.R. 1993. Coelomycetous anamorphs with appendage-bearing conidia. Mycologue Publications, Waterloo. 1101 pp.

Punithalingam, E. 2003. Nuclei, micronuclei and appendages in tri- and tetraradiate conidia of *Cornutispora* and four other coelomycete genera. Mycological Research, 107: 917-948.

Sutton, B.C. 1980. The coelomycetes. Commonwealth Mycological Institute, Kew. 696 pp.

Sutton, B.C. and L.-E. Muhr. 1986. *Cheiromycina flabelliformis* gen. et sp. nov. on *Picea* from Sweden. Nordic Journal of Botany, 6: 831-836.

Opuscula Philolichenum, **7**: 21-28. 2009.

Two new species of *Lecanora* with gyrophoric acid from North America

KERRY KNUDSEN[1] & JAMES C. LENDEMER[2]

ABSTRACT. – *Lecanora gyrophorica* and *L. munzii,* two new species containing gyrophoric acid, are described from North America. In the genus *Lecanora*, gyrophoric acid has previously been reported only in *L. salina*, a species that occurs on siliceous coastal rocks in Europe and in eastern North America in Maine (U.S.A.) and Canada.

INTRODUCTION

The genus *Lecanora* Ach. is one of the largest and most diverse genera of crustose lichens in the North American lichen biota. Indeed, more than two hundred species are presently known from the continent north of Mexico (Esslinger 2008), with many additional species occurring in the Greater Sonoran Desert Region just south of this artificial border (Ryan et al. 2004). Despite the numerous studies of *Lecanora* in North America, undescribed and unreported species continue to be found (Fryday 2006, LaGreca & Lumbsch 2001, Lendemer & Knudsen 2009, Lumbsch et al. 2003, Printzen 2001, Śliwa 2007, van den Boom 2007). As part of our ongoing studies of North American crustose lichens we describe two additional species of *Lecanora* here. These two species are particularly important because of their unusual secondary chemistry. Both produce gyrophoric acid, a substance previously known only from *L. salina* H. Magn., a member of the *L. dispersa* group, which occurs on siliceous coastal rocks in Europe and in eastern North America in Maine (U.S.A.) and Canada (Śilwa 2007). The first species, *L. gyrophorica*, is a placodioid taxon endemic to the Ozark Ecoregion and surrounding areas. The second, *L. munzii*, is a member of a group of lignicolous species that normally contain usnic or isousnic acid, endemic to the chaparral belt of southern California.

MATERIALS AND METHODS

Material was studied dry using a Bausch & Lomb StereoZoom 7 dissecting microscope. Microscopic characters were measured in water with an Olympus BX51 compound microscope and images were captured using an Olympus DP20 digital camera with Microsuite Special Edition. Illustrations were prepared using Adobe Photoshop. Sections of the thallus and apothecia were prepared by hand cutting with a razor blade and mounted in water. Measurements are based on water mounts. Specimens were analysed chemically using standard spot tests (reagents are abbreviated following Brodo et al. (2001)) and thin layer chromatography (TLC). Thin layer chromatography was carried out using solvent systems A or C following the standardized methods of Culberson & Kristinsson (1970).

[1]KERRY KNUDSEN – The Herbarium, Department of Botanty and Plant Sciences, University of California at Riverside, Riverside, CA 92521-0124, U.S.A. – e-mail: kk999@msn.com
[2]JAMES C. LENDEMER – Cryptogamic Herbarium, Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY 10458-5126, U.S.A. – e-mail: jlendemer@nybg.org

1. *Lecanora gyrophorica* Lendemer sp. nov.
MYCOBANK #515360.

Lecanorae muralis similis sed acidum gyrophoricum continens.

TYPE: **U.S.A. MISSOURI**. LAWRENCE CO.: Paris Springs Access, ca. 3.5 mi W of Halltown, ca. 0.5 mi N of jct of Hwys 96 & 266, vicinity of Turnback Cave, 37°11'39"N, 93°41'34"W, mesic E-facing limestone bluff, on chert in overgrown glade, 27.iii.2006, *J.C. Lendemer 6460* (NY, holotype).

DESCRIPTION. – Thallus placodioid, without isidia or soredia, color varying from dull gray-green to intense greenish-yellow, forming large rosettes composed centrally of ± confluent irregularly shaped areoles and marginally of long overlapping lobes that "creep" over the substrate; prothallus absent; upper surface dull to somewhat shiny, occasionally covered with a dense coarse pruina of calcium oxalate crystals; upper cortex 20-30 µm thick, prosoplectenchymatous, consisting of tightly packed anticlinal hyphae densely inspersed with gyrophoric acid crystals (C+/KC+ pink, K insoluble); medulla white, prosoplectenchymatous, composed of loosely woven irregularly oriented hyphae, ~90-110 µm thick, with a distinct algal layer in which the photobiont is arranged in vertical columns or bundles; lower surface pale white to brownish; lower cortex thin and poorly developed, essentially consisting of several layers of gelatinized hyphae, the lowermost of which is basally dark brownish, often with wafts of short hyaline attachment hyphae; apothecia lecanorine, laminal and often borne in the axils of the lobes or irregularly shaped areoles, broadly attached and sessile, becoming ± basally constricted and flexuose with age; disc waxy yellow, epruinose; margin concolorous with the thallus, often radially cracked and becoming excluded with age; epihymenium brownish, inspersed with fine granules (POL+, K soluble); hymenium hyaline, not inspersed, 50-60 µm tall; hypothecium hyaline, of highly variable thickness depending on the age of the apothecium and distance from the stipe; exciple as in *L. muralis*, with a well developed cortex and algae arranged in irregular bundles; asci clavate, *Lecanora*-type, 8-spored; ascospores hyaline, simple, irregularly arranged within the ascus, (10.9)-13.5-(16.1) x (4.8)-5.5-(6.5) µm; pycnidia not seen.

ETYMOLOGY. – The epithet denotes the unusual cortical chemistry of the species.

CHEMISTRY. – Usnic acid (cortex), gyrophoric acid (cortex), zeorin, 3 unidentified terpenoids, leucotylin. Spot tests: Cortex, K+ yellowish, KC+ pink, C+ pink, P-, UV-; medulla K-, C-, KC-, P-, UV-. It should be noted that terpenoid profile of *Lecanora gyrophorica* appears to be identical to that of other populations of *L. muralis* from North America that we have studied.

ECOLOGY AND DISTRIBUTION. – *Lecanora gyrophorica* is presently known only from HCl- substrates (sandstone, chert) in open glade or glade-like habitats in the Ozark Ecoregion (Plate 1, figure 2) and from a disjunct population in Iowa. The distribution of this species mirrors that of other taxa that have recently been described from the Ozarks (Harris & Ladd 2007) in being primarily distributed within that region but also having rare disjunct populations in surrounding areas. In light of the conspicuous nature of placodioid *Lecanora* species and the depth in which *L. muralis s.l.* has been studied, the distribution of *L. gyrophorica* is almost certainly "real" and not an artifact of collection bias.

GENERIC PLACEMENT. – It is widely accepted that the genus *Lecanora* Ach. in a broad sense includes several elements that could be recognized as distinct genera, among which is the group of species centered around *L. muralis*. The name *Protoparmeliopsis* M. Choisy is available for this group if it were to be recognized at the generic level. Although this name has been taken up in some recent checklists (e.g., Hafellner & Türk 2001, Santesson et al. 2004), we have been unable to locate a published explanation for this decision. As such, we believe that considering the incomplete state of our knowledge of *Lecanora* s.l. it is premature to recognize segregate genera such as *Protoparmeliopsis* and thus have chosen to retain the new species within *Lecanora*.

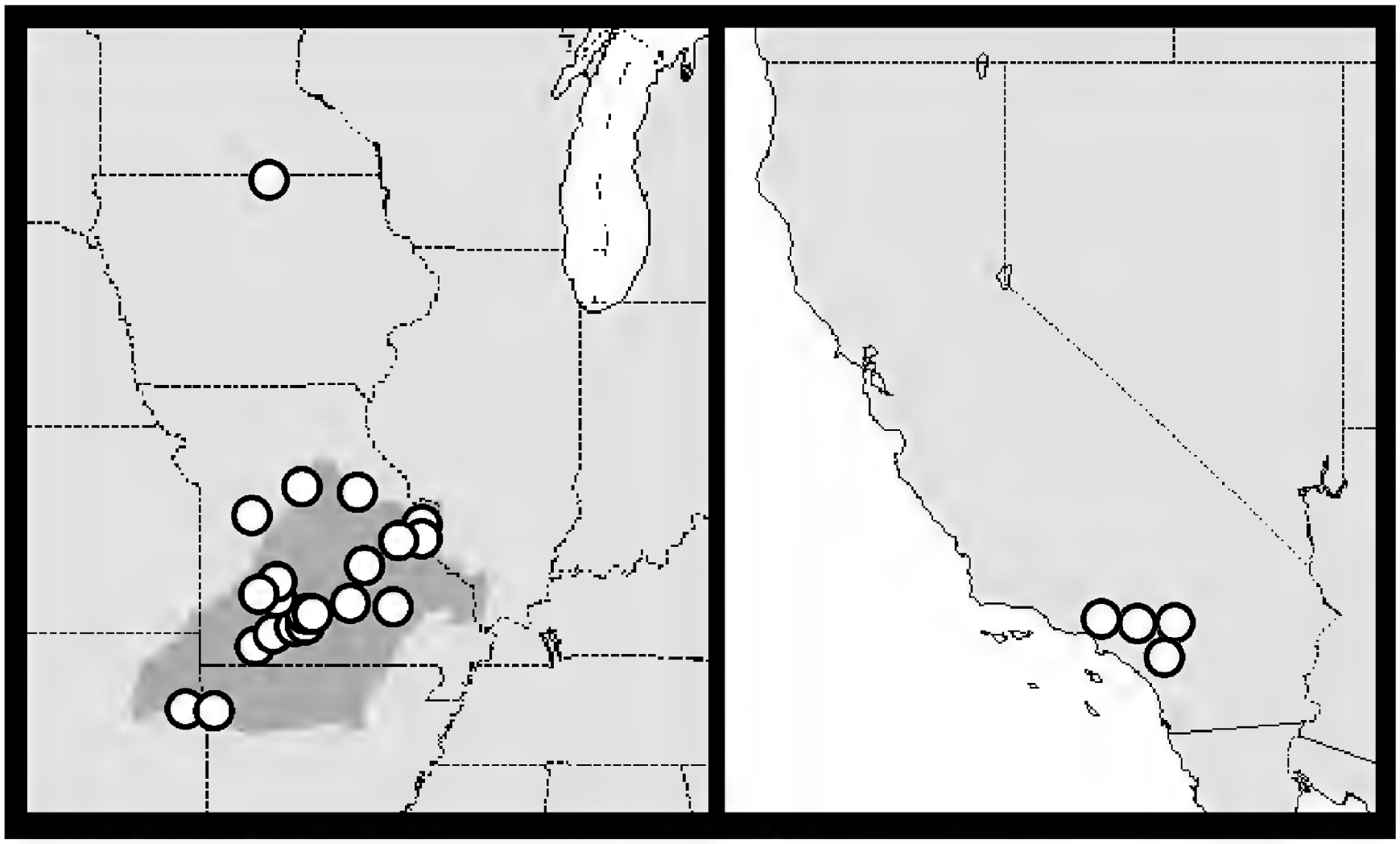


Plate 1. Geographic distribution of *Lecanora gyrophorica* (right) and *L. munzii* (left). Approximate area of Ozark Ecoregion shaded in right figure.

Discussion. – *Lecanora muralis* is a notoriously variable species with respect to both chemistry and morphology and according to some authors represents a complex of closely related species (Ryan et al. 2004). We have chosen to recognize *L. gyrophorica* as distinct from *L. muralis* on the basis of its restricted geographic distribution correlated with the presence of gyrophoric acid, a character rare in the genus *Lecanora*. Although the new species is morphologically indistinguishable from *L. muralis,* it seems illogical to combine these distinctive populations and further expand the circumscription of an already highly variable taxon. Similarly, we have chosen not to recognize *L. gyrophorica* as an infraspecific taxon under *L. muralis* because of the absence of independent (molecular) data regarding the relationships of the two entities.

Selected Specimens Examined. – **U.S.A. ARKANSAS**. CRAWFORD CO.: Ozark National Forest, Natural Dam, 15.iv.2004, *R.C. Harris 49123* (NY). **ILLINOIS**. PIKE CO.: Sessions Hill Prairie, 3 mi SE Kinderbrook, 25.ix. 1992, *L.R. Phillippe 20941* (NY). **IOWA**. HOWARD CO.: along Co. Rd. V58, 1 mi N of Co. Rd. A23, 29.ix.1991, *W.R. Buck 20945* (NY). **MISSOURI**. DENT CO.: Indian Trail Conservation Area, W of MNR Rd. 1019, 3.xi.2004, *W.R. Buck 47465* (NY), *R.C. Harris 50180,* (NY), *R.C. Harris 50195* (NY). GREENE CO.: Rocky Barrens Conservation Area, 16.iv.2005, *W.R. Buck 48674* (NY), *W.R. Buck 48689* (NY); Wilson's Creek National Battlefield, 29.x.2000, *W.R. Buck 38358* (NY), *R.C. Harris 44142* (NY). JEFFERSON CO.: Valley View Glades Natural Area, 12.x.2003, *W.R. Buck 45153A* (NY), *R.C. Harris 48173* (NY); 6.5 mi W of DeSoto, iv.1989, *B.H. Allen 7861* (NY); above Ridenor Hollow, 19.ix.1990, *W.R. Buck 18018* (NY), *R.C. Harris 25418* (NY). MONTGOMERY CO.: Danville Glade Natural Area, 27.x.2001, *W.R. Buck 40560* (NY), *R.C. Harris 45710* (NY). OZARK CO.: Mark Twain National Forest, N of FS Rd. 147, 20.v.2003, *R.C. Harris 47464,* (NY), *R.C. Harris 47456* (NY); Mark Twain National Forest, Smoke Tree Scenic Lookout, 11.x.1997, *W.R. Buck 31987* (NY), *R.C. Harris 41385,* (NY), *R.C. Harris 41414* (NY), 16.iv.1997, *R.C. Harris 40617* (NY). SHANNON CO.: downstream from Rocky Falls, 24.ix.1990, *R.C. Harris 25767* (NY). STONE CO.: Pilot Knob Conservation Area, E of MO 39, 15.x.2005, *W.R. Buck 49491* (NY), *R.C. Harris 51699* (NY). TANEY CO.: Along W side of MO 125, ~0.9 mi N of Hercules Tower Rd., 18.iv.1997, *R.C. Harris 40689* (NY); Henning Conservation Area, 5.xi.2002, *W.R. Buck 42925* (NY), *R.C. Harris 46753* (NY); Hercules Glades Wilderness, 20.v.2003, *R.C. Harris 47580* (NY). TEXAS CO.: Gist Ranch Conservation Area, 4.xi.2004, *R.C. Harris 50285* (NY). WASHINGTON CO.: Pea Ridge Conservation Area, 24.v.2003, *W.R. Buck 44692* (NY). **OKLAHOMA**. LEFLORE CO.: just E of Whitesboro, 19.vii.1962, *D. Keck 1649* (NY).

2. *Lecanora munzii* K. Knudsen & Lendemer sp. nov.

MYCOBANK #515361.

Similis *Lecanorae crassithallinae* sed acidum gyrophoricum continens, acidum isousnicum destitutus, et ascosporis simplicibus, (10.1)-11.3-(12.4) x (4.6)-4.9-(5.2) µm.

TYPE: **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Claremont, Bernard Biological Field Station, back area called "The Neck", 34°06'58"N, 117°42'15"W, 418 m, common on dead wood of *Artemisia californica* on ground from senescent shrub that had disintegrated, 26.iv. 2009, *K. Knudsen 10932 & N. Hamlett = Lich. East. N. Amer. Exs. VIII: 152* (UCR, holotype; NY, isotype, 20 additional isotypes to be distributed)

DESCRIPTION. – Thallus of subcorticate, verruculose areoles, areoles contiguous or dispersed, irregular in shape, 0.1-0.2 x 0.5-0.3 mm wide, to 0.2 mm thick. Surface dull brown to dull-brownish green, epruinose, rugulose. *Apothecia* numerous, round, sessile, 0.1-0.3 mm in diameter; disc reddish-brown, epruinose, becoming convex; margin prominent, usually entire, becoming excluded, concolorous with thallus. Amphithecium without true cortex, laterally to 50 µm, basally 80 µm wide, of irregularly short-celled hyphae, lumina less than 2 µm wide, obscure due to dark pigmentation; parathecium 10-15 µm wide; hypothecium to 50 µm high, colorless; subhymenium 20-30 µm high; hymenium 40-60 µm high, colorless, gelatinized; epihymenium 8-10 µm high, brownish, with a thin gelatinous surface, few granules; paraphyses simple, 1.0-2.0 µm wide, apices usually with dark pigment caps, up to 4 µm wide; ascospores colorless, simple (10.1)-11.3-(12.4) x (4.6)-4.9-(5.2) µm. Pycnidia common, black, immersed to sessile, 10-20 µm wide; conidia simple, hyaline (5.4)-5.9-(6.5) x (1.6)-1.9-(2.4) µm.

ETYMOLOGY. – The species is named after the great California botanist Philip A. Munz (1892-1974) of Rancho Santa Ana Botanic Garden. He was a Professor of Botany at Pomona College and served as dean for three years. His book *A flora of southern California* (Munz 1974), which he researched and wrote without any financial support, introduced the first author to the beauty and value of taxonomic description and inspired his love of California's biodiversity.

CHEMISTRY. – Gyrophoric acid (thallus). Spot tests, K-, KC+ weak pink (in squash mount), C + pale pink (in squash mount), P-, UV-.

SUBSTRATE AND ECOLOGY. – Solitary, usually on dead trees and shrubs, on wood or old rough bark of coastal sage shrub and chaparral including *Adenostoma fasciculatum* Hook & Arn., *Artemisia californica* Less., *Rhus ovata* S. Watson, and *Sambucus mexicana* C. Presl. Often on scattered branches of senescent shrubs lying on the ground in old growth coastal sage shrub or chaparral communities. The collection from Santa Rosa Plateau was on wood of *Quercus engelmannii* E. Greene, a relatively rare oak, in a woodland area interspaced with large areas of old-growth chaparral.

DISTRIBUTION. – Southern California (Los Angeles, Orange, Riverside, and San Bernardino Counties) from 263-533 meters, in foothill canyons, on the floodplains of the San Gabriel and San Bernardino Mountains.

DISCUSSION. – *Lecanora munzii* is similar in morphology to usnic or isousnic acid containing species with an ecorticate amphithecium, like members of the *L. strobilina* group, or *L. americana* (B. de Lesd.) Printzen, but differs from them in containing gyrophoric acid (Printzen 2001). Like several of the species with usnic or isousnic acid treated by Printzen, such as *L. albellula* Nyl., it occurs on wood or old bark. *Lecanora munzii* appears most closely related to *L. crassithallina* van den Boom (van den Boom 2007), which also has a gelatinized hymenium, but contains isousnic acid (major), 7-*O*-methylnorascomatic acid (minor), and atranorin (minor) and lacks gyrophoric acid. *Lecanora crassithallina* differs morphologically from *L. munzii* in having larger apothecia with thick margins (0.2-0.6 mm vs. 0.2-0.4 mm) and a very conspicuous thallus, abundant pycnidia, and ascospores which are slightly shorter and narrower than those of *L. munzii* [9-11 x (2.5-)3-4.5 µm vs. (10.1)-11.3-(12.4) x (4.6)-4.9-(5.2) µm]. They have very different gestalts, with *L. crassithallina* originally mistaken for a *Lecania* by the collector (van den Boom 2007).

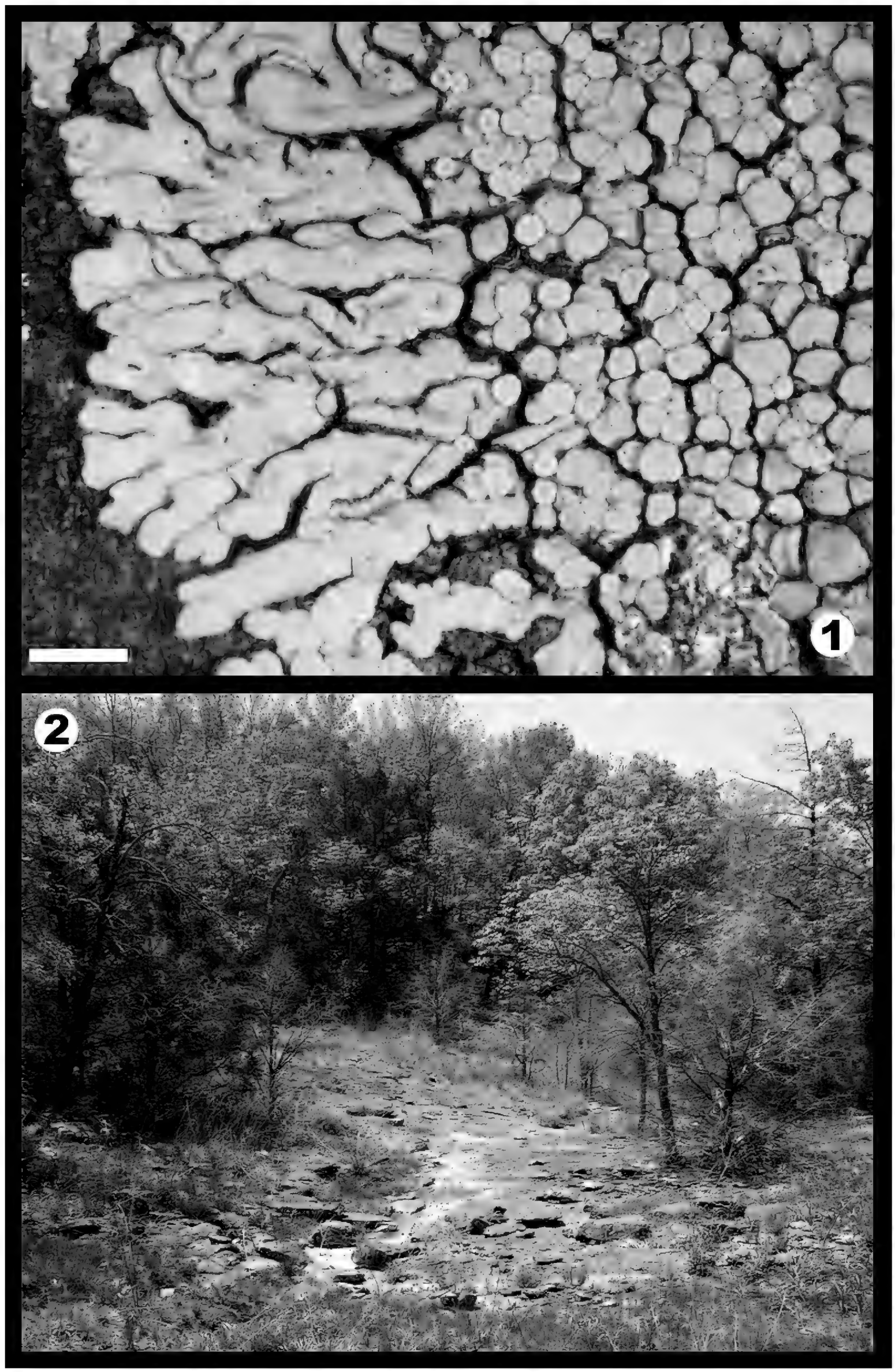


Plate 2. *Lecanora gyrophorica*. Figure 1, thallus and habit (*Buck 20945*, NY; scale = 1 mm). Figure 2, typical habitat, a glade in Cookson County, Oklahoma (where *Harris 48997* was collected; photo by Tony Kirchgessner)

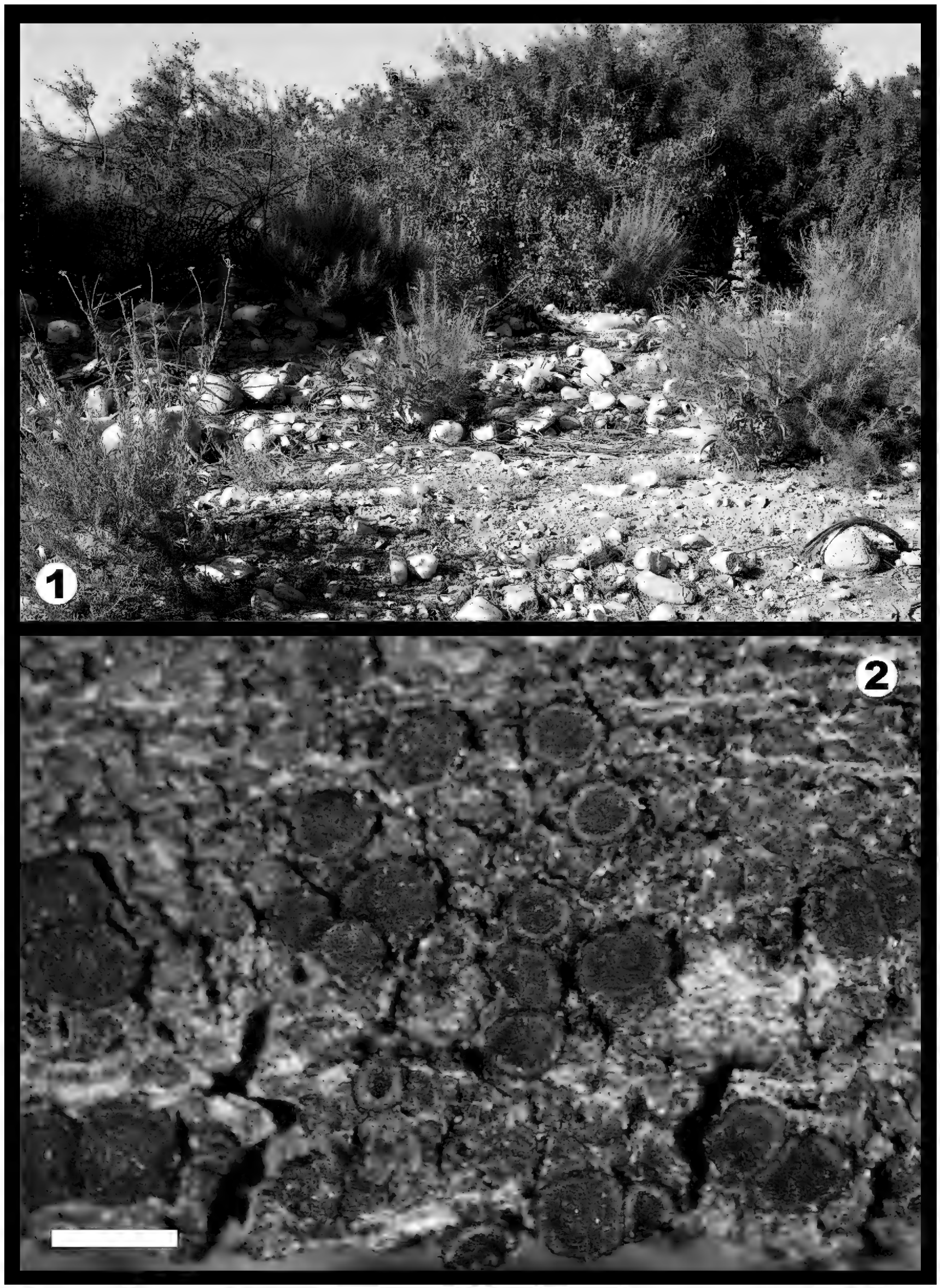


Plate 3. *Lecanora munzii*. Figure 1, type locality. Figure 2, thallus and apothecia (isotype, NY, scale = 0.5 mm).

The species also differ in their ecology. While *Lecanora crassithallina* was also collected on wood (of a fence post) and no doubt occurs on the wood of native trees, it occurs above 2000 meters in the Sierra Madre Occidental Mountains of Sonoran Mexico which are dominated by Madrean pine-oak woodlands. The Madro-Tertiary vascular element of California comprises about one third of the floristic diversity of the region (Raven 1977). Both *L. crassithallina* and *L. munzii* occur in historically related communities of phorophytes of the Madro-Tertiary flora, with *L. crassithallina* occurring in the elevational range of yellow pine forest in southern California. It is apparently a montane species.

Lecanora munzii occurs in a distinct elevational range in chaparral and coastal sage shrub communities in southern California, and is probably associated with these vegetation types in Mexico or in central California. The shrubs and trees in these communities are relatively short-lived, with life spans of forty to seventy years. In old-growth coastal sage shrub or chaparral, in areas where natural fire incidents are relatively infrequent, the shrubs die and disintegrate, littering the ground and offering abundant substrate for lignicolous species. This is the case in the type locality of *L. munzii*, where no fires have been recorded since the 1960's. Throughout California anthropogenic fires have become common and many chaparral areas have increased fire frequencies of twenty years or less, making old-growth coastal sage shrub and chaparral increasingly rare. Fires incinerate the decorticate wood and char the old shrubs, eradicating the substrates occupied by *L. munzii*. The species appears to be infrequent in southern California and so far this species has only been found at six sites. A search of the extensive collections at NY made throughout southern California by H.E. Hasse in the early twentieth century failed to reveal any historical records, although there is one recent collection from the Santa Monica Mountains where he regularly collected. In fact, with the climate of California tending to become more arid, fires are becoming the primary threat to lichen biodiversity in this biological hot spot. They are certainly the primary threat to the survival of *L. munzii*.

Specimens Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Claremont, Bernard Biological Field Station, front area near entry to Rancho Santa Ana Botanic Garden (proposed site of parking lot), 34°06'29"N, 117°42'51"W, 389 m, on wood of dead *Artemisia californica*, 26.iv.2009, *K. Knudsen 10939.2 & N. Hamlett* (UCR); City of Los Angeles, Santa Monica Mountains, Griffith Park, Royce Canyon, 34°8'29"N 118° 18'26"W, 263 m, on wood of dead shrub, 10.ii.2005, *K. Knudsen et. al. 2355* (UCR). ORANGE CO.: Santa Ana Mountains, Weir Canyon, N/S of Windy Ridge Rd. above toll way, 33°50'21"N 117°43'13"W, 374 m, on old wood fence, 17.v.2006, *K. Knudsen 6093* (NY, UCR). RIVERSIDE CO.: Wildomar, Menifee Hills, west side of narrow valley, 33°37'17"N 117°14'17"W, 574 m, locally common on wood of dead *Adenostoma fasciculatum*, 30.vii.2003, *K. Knudsen 386* (UCR); Santa Ana Mountains, Santa Rosa Plateau, wildlife corridor along Avacado Mesa Rd., 23°29'42"N 117°20'02"W, 707 m, Engelmann oaks and basalt, on wood, 4.x.2008, *J.C. Lendemer 14714 & K. Knudsen* (NY). SAN BERNARDINO CO.: base of San Bernardino Mountains in flood plain of the Santa Ana River along Greenspot Road, on wood of dead *Sambucus mexicana,* 34°05'31"N 117°6'45"W, 533 m, 1.v.2006, *K. Knudsen 5972 & M. Knudsen* (H, NY, PRM, UCR, UGDA, UPS).

Acknowledgments

We thank T. Beckman for his picture of the type locality of *Lecanora munzii*, and N. Hamlett and the Friends of the Bernard Biological Field Station for their support. C. Printzen and J. Elix also graciously provided reviews of the manuscript. R.C. Harris is thanked for providing the habitat photo of *L. gyrophorica*.

Literature Cited

Brodo, I.M., S.D. Sharnoff & S. Sharnoff. 2001. Lichens of North America. Yale University Press, New Haven, London. 795 pp.

Culberson, C.F., and H. Kristinsson. 1970. A standardized method for the identification of lichen products. Journal of Chromatography, 46: 85–93.

Esslinger, T.L. 2008. A cumulative checklist for the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. North Dakota State University: http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm (First Posted 1 December 1997, Most Recent Version (#14) 8 October 2008), Fargo, North Dakota.

Fryday, A.M. 2006. New and interesting North America lichen records from the alpine and sub-alpine zones of Mt. Katahdin, Maine. The Bryologist, 109(4): 570–578.

Hafellner, J. and R. Türk. 2001. Die lichenisierten Pilze Österreichs - eine Checkliste der bisher nachgewiesenen Arten mit Verbreitungsangaben. Stapfia, 76: 1–167.

Harris, R.C. and D. Ladd. 2007. New taxa of lichens and lichenicolous fungi from the Ozark ecoregion. Opuscula Philolichenum, 4: 57–68.

LaGreca, S. and H.T. Lumbsch. 2001. Three species of *Lecanora* new to North America, with notes on other poorly known lecanoroid lichens. The Bryologist, 104(2): 204–211.

Lendemer, J.C. and K. Knudsen. 2009. Two new usnic acid containing species of *Lecanora* from Western North America. Opuscula Philolichenum, 6: 73–80.

Lumbsch, H.T., M.I. Messuti, and T.H. Nash III. 2003. New or overlooked species in the *Lecanora subfusca* group from southwestern North America (Lecanorales, Ascomycotina). The Bryologist, 106(4): 552–559

Munz, P.A. 1974. A flora of southern California. University of California Press, Berkeley. 1086pp.

Printzen, C. 2001. Corticolous and lignicolous species of *Lecanora* (Lecanoraceae, Lecanorales) with usnic or isousnic acid in the Sonoran Desert Region. The Bryologist, 104(3): 382–409.

Raven, P. 1977. The California Flora, pp. 109-193, in Barbour, M.G. & J. Major (eds.), Terrestrial Vegetation of California, USA & Canada: Wiley-Intrascience Publication, pp. 1002.

Ryan, B.D., H.T. Lumbsch, M.I. Messuti, C. Printzen, L. Sliwa, and T.H. Nash III. 2004. *Lecanora. In:* T.H. Nash III, B.D. Ryan, P. Diederich, C. Gries, F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 2. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 176–286.

Santesson, R., R. Moberg, A. Nordin, T. Tønsberg, and O. Vitikainen. 2004. Lichen-forming and Lichenicolous Fungi of Fennoscandia. Museum of Evolution, Uppsala University, Uppsala, Sweden. 359 pp.

Śliwa, L. 2007. A revision of the *Lecanora dispersa* complex in North America. Polish Botanical Journal, 52(1): 1–70.

van den Boom, P. 2007. *Lecanora crassithallina* (Lecanoraceae), a new lichen from northern Mexico. The Bryologist, 111 (3): 483–486.

Opuscula Philolichenum, 7: 29-48. 2009.

Lichens, Lichenicolous and Allied Fungi of the Santa Monica Mountains, Part 4: Additions and Corrections to the Annotated Checklist

Kerry Knudsen[1] & Jana Kocourková[2]

ABSTRACT. – Seventy-six fungi (53 lichens, 20 lichenicolous fungi, and 3 allied fungi) are reported new for the Santa Monica Mountains for a revised total of 316 taxa comprising 288 lichens, 25 lichenicolous fungi, and 3 allied fungi. The new species *Lichenodiplis rinodinicola* is described. *Rhizocarpon subpostumum* is reported new for North America. *Lecanora impudens*, *Lichenodiplis lecanorae* (see comments below), *Lichenoconium xanthoriae*, *Phaeosporobolus alpinus* and *Phoma cladoniicola* are reported new for California. *Endoccocus matzeri* is verified from California. Seven species not collected since 1915, *Arthonia subdispuncta*, *Placopyrenium heppioides*, *Pseudocyphellaria anomala*, *Sphaerellothecium breussii*, *Thelenella hassei*, *T. inductula*, and *T. sychnogonioides*, are discussed, increasing the number of species not collected since 1915 to 18 taxa with a total of 50 or more expected when our study of historical records is completed. *Acarospora schleicheri*, previously only known from frequent historical records, was re-discovered and is rare.

Introduction

This paper represents the fourth part in an on-going floristic study of the Santa Monica Mountains (Knudsen 2005 & 2007; Knudsen et al. 2008). It represents additions and corrections of the official annotated checklist published in 2007 which is maintained and revised annually for the National Park Service.

The methods in this contribution follow those of previous installments of the series (see Knudsen 2007) and our previous studies of lichenicolous fungi (Knudsen et al. 2009; Kocourková & Knudsen 2009a). In some reports only selected specimens are cited, one from each of the two counties which encompass the Santa Monica Mountains if possible. Species published by Hasse based on Nylander's or Stizenberg's notes are consistently attributed to Nyl. ex Hasse or Stizenb. ex Hasse (see Knudsen & Lendemer 2006). More information on most individual specimens and other collections from the Santa Monica Mountains is available online at the UCR http://sanders5.ucr.edu/lichensflat_index.php or the Consortium of North American Lichen Herbaria http://symbiota.org/nalichens/collections/index.php.

I. – New Species

Lichenodiplis rinodinicola **Kocourk. & K. Knudsen sp. nov.**

Mycobank #515362.

Conidiomata pycinidia, lichenicola, immersa ad erumpescentia, ad partem apicalem brunnea, ad partem inferiorem hyalina, ovoidea vel cylindrica, 40–50 × 50–80 µm diam. Cellulae conidiogenae cylindricae sed lageniformes, 4–7–10 µm longae, 2.0–3.5 µm latae. Conidia 1-septata, palide brunea, late ellipsoidea, 7.5–9.0 µm longa, 3–4.0(–4.5) µm lata, cum parietibus tenuibus.

[1]Kerry Knudsen – The Herbarium, Department of Botany and Plant Sciences, University of California at Riverside, Riverside, CA 92521-0124, U.S.A. – e-mail: kk999@msn.com

[2]Jana Kocourková – Faculty of Environmental Sciences, Department of Ecology, Czech University of Life Sciences Prague, Kamýcká 129, CZ–165 21 Praha 6 - Suchdol, Czech Republic – e-mail: kocourkovaj@fzp.czu.cz

TYPE: **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Santa Monica Mountains, Leo Carillo State Park, Nicolas Flats, near the lake, 34°03'50'N, 118°54'35''W, 434 m, on *Quercus agrifolia*, on apothecia of *Rinodina* sp., 14.viii.2008, *J. Kocourková 7323 & K. Knudsen* (PRM 915674, holotype).

DESCRIPTION. – Conidiomata pycnidial, arising singly, scattered, immersed at first but becoming erumpent with the uppermost third, ellipsoidal, dark brown at upper 1/3, hyalin below, 50–80 × 40–50 µm; brown upper third of wall 5–6 µm thick, composed of 2 layers of cells, hyaline wall 4–5(–6) µm thick, of only 1 layer of hyaline thin-walled cells bearing conidiogenous cells; no well-defined ostiolum, opening by a disintegration of the upper wall to release the conidia. Conidiogenous cells lageniform to cylindrical, lining almost the whole pycnidial cavity, hyaline, (4–)7–10 × 2–3.5 µm. Conidia holoblastic, cylindrical to ellipsoidal, pale brown, 1–septate, thin and smooth-walled, apex rounded, base truncate with narrow 1 µm wide scar, often hardly visible, 7.5–9 × 3–4(–4.5) µm.

ETYMOLOGY. – Named after the host genus.

ECOLOGY. – The species occurs in the apothecial disc of the host. It may supress the development of ascospores (similar to the infection caused by *Lichenodiplis lecanorae* (Vouaux) Dyko & D. Hawksw.). Most likely the host is *Rinodina santa-monicae* H. Magn.

DISTRIBUTION. – *Lichenodiplis rinodinicola* is currently known only from the type locality.

DISCUSSION. – The conidia of *Lichenodiplis rinodinicola* were consistently 7.5–9 µm × 3–4(–4.5) µm wide. *Lichenodiplis lichenicola* D. Hawksw. & Dyko, the other known *Lichenodiplis* species on *Rinodina,* described from the corticolous *R. septentrionalis* Malme in Norway (Hawksworth & Dyko 1979) differs from *L. rinodinicola* in having conidia which are longer and narrower, 9.5–13 × 2.5–3 µm and longer conidiogenous cells 8.5–17 × 2–2.5 µm.

Lichenodiplis lecanorae has smaller and narrower conidia 4–7.5 × 2–3 µm, and grows on diferent host genera (*Caloplaca, Diploschistes, Evernia, Imshaugia, Lecania, Lecanora, Lecidea, Lecidella, Micarea, Mycoblastus, Pertusaria, Schismatomma* and *Tephromela* (Kocourková 2000), but the type is growing on *Caloplaca cerina* (Ehrh. ex Hedw.) Th. Fr. (Hawksworth & Dyko 1979). According to Hawksworth & Dyko (1979) and Diederich (2003), the current concept of *L. lecanorae* is heterogenous and encompasses multiple taxa.

II. – NEW RECORDS

Entries for each taxon are arranged alphabetically by genus and species. Lichenicolous fungi are denoted with an asterisk "*" following the name while non-lichenized fungi treated with lichens are denoted with a dagger "†".

1. *Abrothallus tulasnei* M. S. Cole & D. Hawksw.*

NOTES. – We currently do not consider *A. tulasnei* a synonym of *A. caerulescens* Kotte like Diederich (2004) because we accept the amyloid reaction of mycelium as a good specific character.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, on *Xanthoparmelia* species, 14.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915681).

2. *Acarospora schleicheri* (Ach.) A. Massal.

NOTES. – Though once common in some areas of the Santa Monica Mountains based on the abundance of Hasse collections (FH), we treated this species as only a historical record (Knudsen et al. 2008) and were happy to find a small extant population. The rarity of this species as well as other terricolous lichens in modern southern California is due to the degradation of terricolous sites by invasive weeds, grazing, nitrate pollution, recreation, and fire or through urban development of suitable habitat.

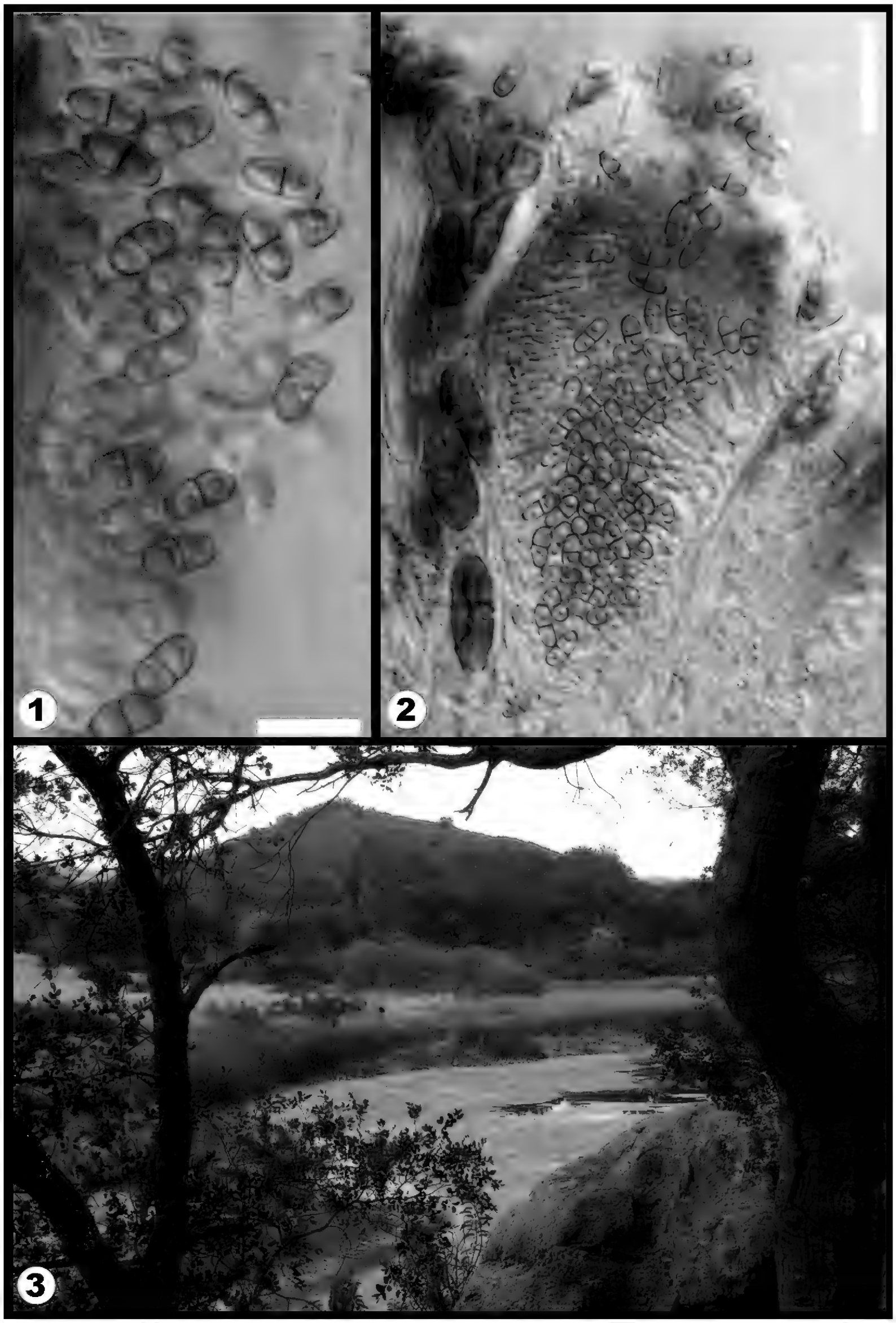


Plate 1. *Lichenodiplis rinodinicola* (figures 1 and 2 from holotype). Figure 1, conidia and conidiogenous cells (scale = 10 µm). Figure 2, section of pycnidium (scale = 20 µm). Figure 3, type locality.

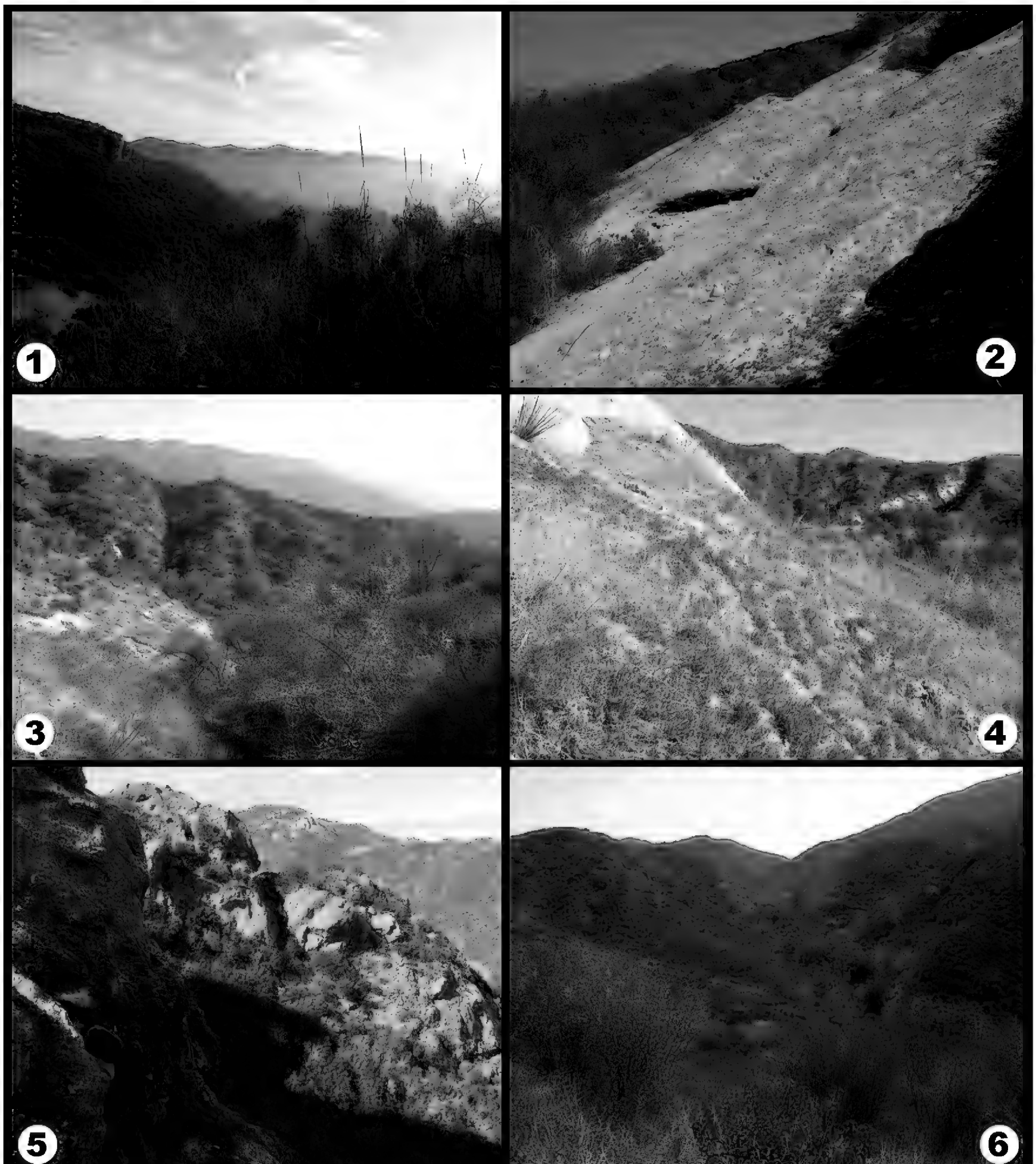


Plate 2. Lichen habitats of the Santa Monica Mountains. Figure 1, Backbone Ridge whose high point is Sandstone Peak. Figure 2, Sandstone slabs near Saddle Peak. Figure 3, Santa Ynez Canyon with exposed limestone lenses. Figure 4, Typical remnant soil habitat on thin-soiled slope with *Selaginella bigelovii* and invasive non-native grass, Conejo Open Space, Westlake. Figure 5, Conejo Mountain. Figure 6, Sycamore Canyon, Point Mugu State Park.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'12" N, 118°51'8"W, 297 m, 24.xi.2008, *K. Knudsen 10706 & J. Kocourková* (UCR).

3. *Arthonia beccariana* (Bagl.) Stizenb. †
(syn. *Arthothelium pruinascens* Zahlbr.)

Notes. – This non-lichenized fungus was collected on *Heteromeles arbutifolia* (Lindley) Roemer, *Juglans californica* S. Watson, *Malacothamnus fasciculatum* (Torrey & A. Gray) E. Greene, and *Umbellularia californica* (Hook & Arn.) Nutt. by Hasse (Sundin 1999). It frequently occurs on the smooth bark of thin young branches of *Quercus agrifolia* Nee.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°6'31"N, 118°55'10"W, 355 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen 9621* (UCR).

4. *Arthonia infectans* Egea & Torrente

Notes. – This lichenized *Arthonia* forms a white crust on rocks. The site on volcanic rock on Point Dume is only the third known population of this species. It was described from the central coast in Monterey County, California (Egea & Torrente 1995) and occurs on Santa Rosa Island (*K. Knudsen 8721 & J. Kocourková*, UCR). It was originally described as a juvenile parasite on *Lecanographa* but in the Santa Monica Mountains it was a juvenile parasite on *Llimonaea cerebriformis* (Egea & Torrente) Sparrius. Like *A. gerhardii* Egea & Torrente and *A. verrucosa* Egea & Torrente, we observed *A. infectans* has curved filiform conidia, 13–20 × 1 µm.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Point Dume Nature Reserve, 34°0'8"N, 118°48'30"W, 10 m, on rock wall, 1.vi.2009, *K. Knudsen 11215 & T. Sagar* (UCR).

5. *Arthonia pinastri* Anzi†

Notes. – This non-lichenized *Arthonia* was collected on the caudex of *Coreopsis gigantea* (Kellogg) H.M. Hall, a distinctive shrub occurring along the coast and the western edge of the Santa Monica Mountains to Conejo Mountain (see *A. subdispuncta* Nyl. ex Hasse in historical section below). This phorophyte is a common substrate for lichens on the Channel Islands, but rarely supports any lichens in the Santa Monica Mountains, probably because of lower annual relative humidity. Circumstantial evidence suggests that the Santa Monica Mountains have become more arid in a short time frame of possibly two hundred years or less. This would have a definite effect on lichen distribution and could eradicate relict species from earlier moister periods.

Specimens Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: hillside above Pacific Coast Highway, west of Yerba Buena Road, 34°3'24"N, 118°58'5"W, 14 m, on *Coreopsis gigantea,* 24.v.2009, *K. Knudsen 11156* (UCR); north slope of Conejo Mountain, 34°11'21"N, 119°1'1"W, 99 m, 12.i.2008, *J.C. Lendemer 11444 & K. Knudsen* (NY, UCR).

6. *Arthonia tetramera* Stizenb. ex Hasse†

Notes. – This non-lichenized fungus usually occurs on the smooth bark of *Quercus agrifolia* and has been collected on *Pinus* at Point Lobos State Reserve by Anders Tehler (Sundin 1999). It is a California endemic with its type locality on Catalina Island (Hasse 1913).

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen* 9635 (UCR).

7. *Arthonia xanthoparmeliarum* Etayo*

Notes. – This lichenicolous fungus occurring on *Xanthoparmelia* species in South America was recently reported new for North America from southern California (Kocourková 2009).

Specimens Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Rocky Oaks, 34°5'54"N, 118°48'45"W, 531 m, 14.viii.2009, on *Xanthoparmelia* sp., *J. Kocourková & K. Knudsen* (PRM 915668, UCR). VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°6'12"N, 118°51'7"W, 291 m, 24.xi.2008, on *X. mexicana*, *J. Kocourková & K. Knudsen* (PRM 915480).

8. *Aspicilia confusa* Owe-Larss. & A. Nordin

Notes. – This is a common species in southern California.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Hennessey (NPS land), N of Mulholland, south of Castro Crest, on N-slope, 34°5'58"N, 118°47'8"W, 445 m, on sandstone, 5.iv.2009, *K. Knudsen 11171* (UCR).

9. *Bactrospora patellarioides* (Nyl.) Almq.

Notes. – This lichen is rare in the Santa Monica Mountains. Hasse originally collected it in Santa Ynez Canyon on *Heteromeles arbutifolia* in 1903 and described it as *Bacidia clemantis* Hasse (Hasse 1910, 1913). This is the first modern collection in the range and occurred on the smooth mature bark of *Quercus agrifolia.*

Specimens Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, 14.viii.2009, on *Quercus agrifolia, K. Knudsen 11590* & *J. Kocourková* (UCR), *J. Kocourková & K. Knudsen* (PRM 915680).

10. *Bagliettoa calciseda* (DC.) Gueidan & Cl. Roux

Notes. – This calciphile was collected on a calcareous site on a ridge above Santa Ynez Canyon.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Los Angeles County: Topanga State Park, 34°5'41"N, 118°33'4"W, 552 m, on limestone, 6.iv.2008, *K. Knudsen 9556 w/ J. Kocourková & B. Landis* (UCR).

11. *Buellia prospersa* (Nyl.) Riddle

Notes. – This saxicolous species is endemic to Sonoran Mexico and coastal southern California. It is a rare species in the Santa Monica Mountains, known only from Point Dume State Reserve in a maritime community on volcanic rock.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Point Dume State Reserve, 34°0'8"N, 118°48'30"W, 10 m, on rock wall, 1.vi.2009, *K. Knudsen 11209 & T. Sagar* (UCR).

12. *Caloplaca persimilis* Wetm.

Notes. – This infrequent species was collected on rough mature bark of a trunk of *Quercus agrifolia.*

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen 9660* (UCR).

13. *Caloplaca stanfordensis* H. Magn.

Notes. – This species was collected on rough mature bark of a trunk of *Quercus agrifolia.*

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen 9661* (UCR).

14. *Catillaria lenticularis* (Ach.) Th. Fr.

NOTES. – This saxicolous species is relatively rare in the Santa Monica Mountains, reported on "slate rock" by Hasse (1913) and the modern collection was on shale.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Latigo Canyton, 34°3'34"N, 118°46'34"W, 361 m, 24.v.2009, *K. Knudsen 11150* (UCR).

15. *Cercidospora caudata* Kernst.*

NOTES. – *Cercidospora caudata* s. l. is common on the apothecia of *Caloplaca squamosa* (B. de Lesd.) Zahlbr. and *C. subsoluta* (Nyl.) Zahlbr. in southern California (Etayo et al. 2007).

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'12"N, 118°51'8"W, 297 m, on *Caloplaca* species, 24.xi. 2008, J. *Kocourková 7347 & K. Knudsen* (hb. Kocourková).

16. *Cercidospora macrospora* (Uloth) Hafellner & Nav.-Ros.*

NOTES. – This lichenicolous fungus is common in southern California, especially above 5000 feet.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'12"N, 118°51'8"W, 297 m, on *Lecanora muralis*, 24.xi. 2008, *J. Kocourková 7349 & K. Knudsen* (hb. Kocourková).

17. *Cladonia maritima* K. Knudsen & Lendemer

NOTES. – This species was originally reported as *Cladonia cervicornis* (Ach.) Flot. (Knudsen 2007). It is rare in the Santa Monica Mountains, currently only known from Zuma Ridge (Knudsen & Lendemer 2009a).

18. *Cliostomum griffithii* (Sm.) Coppins

NOTES. – This species was reported by Hasse from the Santa Monica Mountains from various barks as *Catillaria tricolor* (With.) Th. Fr. (Hasse 1913).

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Mugu State Park, Sycamore Canyon, 34°8'10"N, 119°0'15"W, 213 m, on *Malacothamnus fasciculatum*, 2.vi.2009, *K. Knudsen 11120 & T. Sagar* (UCR).

19. *Collema nigrescens* (Hudson) DC.

NOTES. – This species is infrequent on *Quercus agrifolia* in the region.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen 9630* (UCR).

20. *Collemopsidium sublitorale* (Leighton) Grube & B. D. Ryan

NOTES. – This is the only intertidal lichen we have found so far along the shores of the Santa Monica Mountains. It occurred on a large flat rock slab with barnacles and algae.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Sequit Point, 34°2'34"N, 118°56'12"W, 0 m, 13.viii.2009, *K. Knudsen 11577 w/ J. Kocourková & T. Sagar* (UCR).

21. *Dactylospora pleiosperma* Triebel*

NOTES. – This lichenicolous fungus, which occurs on *Lecanora caesiorubella* Ach., was previously known in California only from Santa Cruz and Santa Rosa Islands (Hafellner 2004). Recently, we collected it in Los Osos in San Luis Obispo County (*K. Knudsen 9928 & J. Kocourková*, UCR).

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Mugu State Park, Wood Canyon, 34°7'38"N, 119°0'51"W, 383 m, on *Lecanora caesiorubella* on *Quercus agrifolia*, 13.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915667).

22. *Dimelaena thysanota* (Tuck.) Hale & W.L. Culb.

NOTES. – This is part of the montane flora more common at higher elevations that occur in the Santa Monica Mountains. Determinations by John Sheard.

SPECIMENS EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga State Park, Santa Ynez Canyon 34°5'28"N, 118°34'48"W, 390 m, on tilted calcareous lenses, 24.xi.2008, *K. Knudsen 10699* w/ *J. Kocourková & T. Sagar* (UCR). VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on Conejo volcanics, 28.v.2008, *K. Knudsen 9646* (UCR).

23. *Dimelaena weberi* Sheard

NOTES. – This saxicolous species occurs on Conejo volcanics on Conejo Mountain. This species was misidentified as *Rinodina parasitica* H. Mayrh. & Poelt, which is removed from the checklist (Knudsen 2007). Determination by John Sheard.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: north side of Conejo Mountain, 34°11'33"N, 119°0'8"W, 63 m, 8.ii.2006, *K. Knudsen 5143.1* (UCR), *K. Knudsen 5143.2* (UCR).

24. *Endococcus matzeri* D. Hawks. & Iturr.*

NOTES. – This fungus is symbiotic on *Buellia* species and was recently described from Antarctica (Hawksworth & Iturriaga 2008). Previously, in a complicated case of nomenclature, this taxon was treated incorrectly as *Endococcus buelliae* (C. W. Dodge) Matzer because of confusion about which of the two fungi in the type specimen was the holotype of *Orbicula buelliae* C. W. Dodge (Hawksworth & Iturriaga 2008). In the resolution of this problem, *O. buelliae* became *Sphaerellothecium buelliae* (C.W. Dodge) D. Hawksw. & Iturr., a totally different and as yet poorly understood species, and *Endococcus buelliae* became an obligatory synonym which had been applied incorrectly to an undescribed taxon which was then described as *E. matzeri*.

Previously *Endoccocus buelliae* was reported from Baja California and California (Kainz & Triebel 2002). We verified our specimens using the revised description of *E. matzeri,* which stresses the ornamentation of the ascospore walls, and can report *E. matzeri* as occurring in southern California and in one collection on a new host, *Mobergia angelica* (Stizenb. ex Hasse) H. Mayrh. & Sheard. *Sphaerellothecium buelliae* is not yet known from California or North America.

SPECIMENS EXAMINED. – **U.S.A. CALIFORNIA**. SANTA BARBARA CO: Santa Rosa Island, Channel Islands National Park, close to NPS housing at margin of Cherry Canyon, 33°59'53"N, 120°3'51"W, 92 m, on *Buellia venusta*, 18.vii.2007, J. *Kocourková & K. Knudsen* (PRM 909682). VENTURA CO.: Santa Monica Mountains, Westlake Village, Conejo Open Space, near Lake Elenor Dam, deep-cut ravine in slope above Highway 23 South, 34°8'12"N, 118°51'8"W, 289 m, on *Mobergia angelica,* 24.xi.2008, *K. Knudsen 10967 w/ J. Kocourková & T. Sagar* (UCR).

25. *Hyperphyscia adglutinata* (Flörke) H. Mayrhofer & Poelt

NOTES. – This species is common on *Quercus agrifolia* and *Juglans californica.*

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Latigo Canyon, 34°4'53"N, 118°47'45"W, 562 m, on *Juglans californica,* 5.iv.2009, *K. Knudsen 11163* (UCR).

26. *Intralichen baccisporus* D. Hawksw. & M.S. Cole.*

NOTES. – This lichenicolous fungus is probably frequent on saxicolous *Caloplaca* species in California.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, on *Caloplaca bolacina,* 14.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915679).

27. *Lecanactis salicina* Zahlbr.

NOTES. – The species was originally described from collections by Hasse on willows in "Rustic Canyon" in the Santa Monica Mountains (Hasse 1913) and is rare in the range. The modern collection was found on *Coreopsis gigantea* at Point Dume and is epruinose. The end cells are usually longer than the center cells with a total of 3-4 septa. In our specimen the end cells sometimes become divided by additional septa thus making the ascospore 5-6 septate rather than 3-4 septate.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Point Dume Nature Reserve, 34°0'8"N, 118°48'30"W, 10 m, on *Coreopsis gigantea* on rock wall, 1.vi.2009, *K. Knudsen 10669 & T. Sagar* (UCR).

28. *Lecania naegelii* (Hepp) Diederich & van den Boom

NOTES. – The species was reported on various barks in the Santa Monica Mountains by Hasse (1913). It is infrequent.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Mugu State Park, Sycamore Canyon, 34°8'10"N, 119°0'15"W, 213 m, on *Malacothamnus fasciculatum*, 2.vi.2009, *K. Knudsen 11125 & T. Sagar* (UCR).

29. *Lecanora confusa* Almb.

NOTES. – The thallus of this species was often completely leprose on smooth bark of the shrub *Malosma laurina* (Nutt.) Abrams.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Mugu State Park: Ranch Center Road on Hidden Pond Trail, near the water tank on ridge between Wood Canyon and Sycamore Canyon., 34°8'2"N, 119°0'37"W, 212 m, on *Malosma laurina,* 13.iix.2009, *K. Knudsen 11549 w/ J. Kocourková & T. Sagar* (UCR).

30. *Lecanora impudens* Degel.

NOTES. – We collected a small amount of this lichen with apothecia on *Malacothamnus fasciculatum.* It is new to California and its distribution in the state is unknown. The identification was verified by J.C. Lendemer (NY) who also confirmed that the collection contains atranorin and chloroatranorin with TLC.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Mugu State Park, upper La Jolla Valley, 34°6'37"N, 119°01'46"W, 270 m, 13.iix.2009, *K. Knudsen 11573 w/ J. Kocourková & T. Sagar* (UCR).

31. *Lecanora munzii* K. Knudsen & Lendemer

NOTES. – This species is described in this volume (Knudsen & Lendemer 2009b) and is rare on wood in the Santa Monica Mountains in Griffith Park in Los Angeles.

32. *Lecidea fuscoatrina* Hertel & Leuckert

NOTES. – This saxicolous lichen is part of the montane lichen flora of the Santa Monica Mountains that is usually found at higher elevations in southern California. This species is frequent in the San Jacinto Mountains above 2000 meters.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks: near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'12"N, 118°51'8"W, 297 m, on Conejo volcanics, 24.xi. 2008, *K. Knudsen 10704 w/ J. Kocourková & T. Sagar* (UCR).

33. *Leptochidium albociliatum* (Desmaz.) M. Choisy

Notes. – This is a common lichen in the mountains of southern California and was reported from the Santa Monica Mountains by Hasse (1913) but is rare in the range.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'12"N, 118°51'8"W, 297 m, on Conejo volcanics, 24.xi. 2008, *K. Knudsen 10701* w/ *J. Kocourková & T. Sagar* (UCR), *J. Kocourková 7350 w/ K. Knudsen & T. Sagar* (hb. Kocourková).

34. *Leptogium californicum* Tuck.

Notes. – This is a common lichen in the mountains of southern California and was reported from the Santa Monica Mountains by Hasse (1913) but is infrequent in the range.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space: slope above Highway 23 South, 34°8'12"N, 118°51'8"W, 297 m, on soil over rock, 24.xi.2008, *K. Knudsen 10702* w/ *J. Kocourková & T. Sagar* (UCR).

35. *Leptogium plicatile* (Ach.) Leighton

Notes. – Rare, collected on limestone, probably in same the general area where Hasse collected it (Hasse 1913).

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga State Park, 34°5'41"N, 118°33'4"W, 552 m, on limestone, 6.iv.2008, *K. Knudsen 9551 w/ J. Kocourková & B. Landis* (UCR).

36. *Lichenoconium erodens* M.S. Christ. & D. Hawksw.*

Notes. – This is a common fungus on a variety of lichens. We do not consider it to be a principally saprobic fungus.

Specimens Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, on *Xanthoparmelia cumberlandia,* 14.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915671); same locality, on *Evernia prunastri, J. Kocourková & K. Knudsen* (PRM 915672).

37. *Lichenoconium xanthoriae* M.S. Christ.*

Notes. – This fungus was originally described on *Xanthoria polycarpa,* its most common host (Christiansen 1956) and occurs on many species of Teloschistaceae. In the Czech Republic, *L. xanthoriae* is one of the first lichenicolous fungi usually found in disturbed habitats after lichens have returned. It is reported new for California and on a new host, *Xanthoria tenax* L. Lindblom.

Specimens Examined. – **U.S.A. CALIFORNIA**. RIVERSIDE CO.: Santa Ana Mountains, Santa Rosa Plateau, near Clinton Keith Road, 33°33'02'N, 117°15'53'W, 563 m, on *Xanthoria tenax*, 11.x.2008, *K. Knudsen 10433* (UCR). VENTURA CO.: Point Mugu State Park, Wood Canyon, 34°7'38"N, 119°0'51"W, 383 m, on *Xanthomendoza fulva*, 13.viii.2009, *J. Kocourková w/ K. Knudsen & T. Sagar* (UCR).

38. *Lichenostigma cosmopolites* Hafellner & Calat.*

Notes. – This is a common species throughout southern California on *Xanthoparmelia* species.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: above Little Sycamore Canyon Road on unnamed National Park Service land, 36°6'44"N, 118°54'59"W, 671 m, 9.ix.2006, *K. Knudsen 7155 & R. Muertter* (UCR).

39. *Lichenothelia renobalesiana* D. Hawksw. & V. Atienza*

Notes. – We recently reported this lichenicolous fungus new to North America from the Santa Monica Mountains (Kocourková & Knudsen 2009b).

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga State Park, 34°5'41"N, 118°33'4"W, 552 m, on *Bagliettoa calciseda* on limestone, 6.iv.2008, *K. Knudsen 9660.2 w/ J. Kocourková & B. Landis* (UCR).

40. *Lichenodiplis lecanorae* (Vouaux) Dyko & D. Hawksw.*

Notes. – We consider this species a new report for California. The previous report of *L. lecanorae*, S. Tucker 34307 (SBBG), Montecito, Santa Barbara Co., on *Pertusaria* (Tucker & Ryan 2006) probably represents another taxon, possibly a *Minutoexcipula*.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, on *Caloplaca cerina,* 14.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915674, in specimen of *Lichenodiplis rinodinicola*).

41. *Llimonaea cerebriformis* (Egea & Torrente) Sparrius

Notes. – This maritime lichen is rare and known from only a handful of locations in California. It occurs only on Point Dume in the Santa Monica Mountains.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Point Dume Nature Reserve, 34°0'8"N, 118°48'30"W, 10 m, on rock wall, 1.vi.2009, *K. Knudsen 11214 & T. Sagar* (UCR).

42. *Muellerella erratica* (A. Massal.) Hafellner & V. John*

Notes. – This lichenicolous fungus was previously treated as *M. pygamea* var. *athallina* (Müll. Arg.) Triebel. An earlier report of *M. lichenicola* (Sommerf. ex Fr.) D. Hawksw. is revised to *M. erratica*. (Knudsen 2007).

Specimens Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga State Park, 34°5'41"N, 118°33'4"W, 552 m, on *Verrucaria muralis*, 6.iv.2008, *K. Knudsen 9660.2 w/ J. Kocourková & B. Landis* (UCR); Leo Carrillo State Park, Arroyo Sequit, 34°3'53"N, 118°55'56"W. 83 m, *on Lecanora subimmergens,* 13.viii.2009, *J. Kocourková & K. Knudsen* (PRM915678).

43. *Ochrolechia arborea* (Kreyer) Almb.

Notes. – The species is rare on the bark of *Quercus agrifolia*.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, on *Quercus agrifolia,* 14.viii.2009, *K. Knudsen 11588 & J. Kocourková* (UCR).

44. *Peltigera rufescens* (Weiss) Humb.

Notes. – This species is rare in the Santa Monica Mountains.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'12"N, 118°51'8"W, 297 m, 24.xi.2008, *K. Knudsen 10705.1 & J. Kocourková* (UCR).

45. *Peltula omphaliza* (Nyl. ex Eckf.) Wetmore

NOTES. – This species is infrequent in the Santa Monica Mountains. Wetmore (1970) reported one Hasse collection from the range.

SPECIMENS EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Hepatic Gulch, off Schueren Road, Saddle Peak area, 34°4'43"N, 118°38'54"W, 698 m, on volcanic rock, 12.iii.2005, *K. Knudsen 3042* (UCR). VENTURA CO.: Party Rock, 34°6'37"N, 118°54'22"W, 698 m, on volcanic rock, 8.ii.2006, *K. Knudsen 5152.3 w/ J. Kocourková & T. Sagar* (UCR).

46. *Phaeosporobolus alpinus* R. Sant., Alstrup & D. Hawksw.*

NOTES. – This lichenicolous fungus is reported new for California.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, on corticolous *Pertusaria* species, 14.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915670, UCR).

47. *Phaeophyscia orbicularis* (Necker) Moberg

NOTES. – This species is frequent in mixed corticolous communities on oaks, though not dominant.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen 9676* (UCR).

48. *Phoma cladonicola* Diederich, Kocourk. & Etayo*

NOTES. – This lichenicolous coelomycete bleaches the squamules of *Cladonia* species and produces easily seen pycnidia with abundant non-septate hyaline conidia 4.7–5.9 × 2.4–3.0 µm (for more information and illustrations see Diederich et al. (2007)). We report it new to California from Summit Peak on West Anacapa Island and from the Santa Monica Mountains on *Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng. Interestingly, so far we have not found it on any of the species endemic to California like *C. nashii* Ahti.

SPECIMENS EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'12"N, 118°51'8"W, 297 m, on *Cladonia chlorophaea*, 24.xi.2008, *K. Knudsen 10705.1 w/ J. Kocourková & T. Sagar* (UCR); West Anacapa Island, Channel Islands National Park, ridge east of Summit Peak, 34°0'44"N, 119°25'42"W, 270 m, common on *C. chlorophaea*, 3.xii.2008, *K. Knudsen 10869* (UCR, PRM 911595).

49. *Physcia clementei* (Sm.) Lynge

NOTES. – This lichen is rare in southern California and on the Channel Islands. A single thallus was found mixed in a Xanthorian community on the endemic California walnut.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga Canyon along Highway 27, 34°8'30"N 118°55'6"W, 362 m, on *Juglans californica,* 15.viii.2004, *K. Knudsen 1548.1* (UCR).

50. *Placocarpus americanus* K. Knudsen, Breuss & Kocourk.

NOTES. – We recently described this new lichenicolous lichen from the Santa Monica Mountains (Knudsen et al. 2009).

SPECIMENS EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Santa Monica Mountains, Agoura Hills, near Kanaan Dume Road, 34°08'37"N, 118°46'00"W, 267 m, on *Lecanora muralis,* early stage of infection, 12.i. 2008, *J.C. Lendemer 11461 & K. Knudsen* (NY, UCR). VENTURA CO.: Santa Monica Mountains, Conejo Open Space, near Lake Elenor Dam, on slope above Highway 23 West, 35°39'50"N, 121°15'46"W, 291 m, on *Lecanora muralis* and Conejo volcanics, 24.xi.2008, *K. Knudsen 10711* w/ *J. Kocourková & T. Sagar* (LI, PRM 859105, UCR).

51. *Placopyrenium noxium* Breuss

NOTES. – The species occurred on Conejo volcanics and was parasitic on *Aspicilia* species, though previously known as parasitic only on *Staurothele areolata* (Ach.) Lettau. This is the fourth known population in California (Breuss 2009; Knudsen & Kocourková *in press*). The conidia were shorter than previously reported (5 µm) and the ascospores smaller (10–12 × 7.5–8 µm) (Breuss 2002), the areoles more adnate, but Cécile Gueidan sequenced the specimen and determined the species.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on Conejo volcanic, 28.v.2008, *K. Knudsen 9656* (LI, PRM, UCR).

52. *Placopyrenium stanfordii* (Herre) K. Knudsen
(syn. *Placopyrenium zahlbruckneri* (Hasse) Breuss)

NOTES. – This species was originally collected in Topanga Canyon in Los Angeles County by Hasse in 1910 (Breuss 2009). It is infrequent in the Santa Monica Mountains.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'10"N, 118°51'13"W, 296 m, on Conejo volcanics on soil(?), 2.vi.2009, *K. Knudsen 11241* (UCR).

53. *Placynthium nigrum* (Hudson) Gray

NOTES. – This species is rare in the Santa Monica Mountains. It grows on limestone.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga State Park, 34°5'41"N, 118°33'4"W, 552 m, on limestone, 6.iv.2008, *K. Knudsen 9552.2 w/ J. Kocourková & B. Landis* (UCR).

54. *Psorotichia schaereri* (A. Massal.) Arnold

NOTES. – This species was collected on calcareous rock and is rare.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Simi Hills, Daryton Canyon, ridge south of Quiet Hills, on calcareous rock, 18.xii.2005, *F. Landis s.n.* (UCR).

55. *Ramalina subleptocarpha* Rundel & Bowler

NOTES. – This species is dominant on chaparral in Point Mugu State Park.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Magu State Park, Sycamore Canyon, Ranch Center Road, 34°8'10"N, 119°0'15"W, 213 m, on *Malacothamnus fasciculatum*, 2.vi.2009, *K. Knudsen 11022 & T. Sagar* (UCR).

56. *Rhizocaropon subpostumum* (Nyl.) Arnold

NOTES. – This species is reported new for North America and is rare in the Santa Monica Mountains. Alan Fryday made the identification, qualifying it as "cf. *subpostumum*" and said "I have a number of specimens that fit the description of this species but they are morphologically variable and I suspect that more than one taxon is involved. Your collection has unusually large ascospores…30–33 µm." According to Fryday, the species is quite frequent in the northeast of North America but has not been reported.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: slope across the road and below turnoff for parking area for Sandstone Peak, 34°6'38"N, 118°55'38"W, 609 m, on Conejo volcanics, 24.v.2009, *K. Knudsen 11160* (MSC, UCR).

57. *Rinodina pacifica* Sheard

NOTES. – This species is rare in the Santa Monica Mountains, occurring in a shaded riparian habitat near the ocean. Determined by John Sheard.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Arroyo Sequit, 34°2'54"N, 118°55'58"W, 65 m, 27.ix.2005, *K. Knudsen 3724.2 & M. Knudsen* (UCR).

58. *Rinodina santa-monicae* H. Magn.

NOTES. – This species is frequent on oaks in mixed corticolous communities.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen 9625* (UCR).

59. *Sarcogyne regularis* Körb.

NOTES. – This species is rare in the Santa Monica Mountains due to the scarcity of calcareous substrates.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga State Park, 34°5'41"N, 118°33'4"W, 552 m, on limestone, 6.iv.2008, *K. Knudsen 9559 w/ J. Kocourková & B. Landis* (UCR).

60. *Sarcopyrenia bacillosa* (Nyl. ex Hasse) Nav.-Ros. & Hladun*

NOTES. – This lichenicolous fungus was originally discovered in the Santa Monica Mountains by Hasse near the Old Soldier's Home. Previously known only from the original collections, *S. bacillosa* has recently been collected in Richmond in central California (Knudsen & Lendemer 2006), San Diego [*Knudsen 10999* (UCR)] and in the Santa Monica Mountains. All three specimens were parasitic on *Acarospora socialis* H. Magn.

SPECIMENS EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'10"N, 118°51'13"W, 296 m, 24.xi.2008, *J. Kocourková w/ K. Knudsen & T. Sagar* (PRM 915677); approximately same location, 2.vi.2009, *K. Knudsen 11240* (UCR).

61. *Schizopelte californica* Th. Fr.

NOTES. – This species is rare in the Santa Monica Mountains, known only from Point Dume Nature Reserve, where the population is small.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Point Dume Nature Reserve, 34°0'8"N, 118°48'30"W, 10 m, on rock wall, 1.vi.2009, *K. Knudsen 11213 & T. Sagar* (UCR).

62. *Sphinctrina leucopoda* (Pers. ex Fr.) De Not.*

NOTES. – The species was collected in the understory of an oak woodland.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Mugu State Park, Wood Canyon, 34°7'38"N, 119°0'51"W, 383 m, on *Lecanora gangaleoides*, 13.viii.2009, *J. Kocourková w/ K. Knudsen & T. Sagar* (PRM 915676).

63. *Staurothele drummondii* (Tuck.) Tuck.

NOTES. – The species is apparently rare in the Santa Monica Mountains.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: below Sandstone Peak, 34°0'7"N, 118°56'0"W, 883 m, on steep drainage of volcanic bedrock, 11.iii.2005, *K. Knudsen 2487* (UCR).

64. *Staurothele elenkinii* Oxner.

NOTES. – This species is rare in the Santa Monica Mountains, found on HCl+ rock. It is verified as occurring in California (Tucker & Ryan 2006).

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Mugu State Park, ridge between upper La Jolla Valley and Wood Canyon along truck trail, 34°6'39"N, 119°01'36"W, 267m, 13.viii.2009, *K. Knudsen 11576.1 w/ J. Kocourková & T. Sagar* (UCR).

65. *Stigmidium epistigmellum* (Nyl. ex Vouaux) Kocourk. & K. Knudsen*

NOTES. – The holotype of this fungus was originally collected by Hasse on *Caloplaca luteominia* (Tuck.) Zahlbr. in the Santa Monica Mountains. We recently revised this species and it is rare in the Santa Monica Mountains, though it is common on the Channel Islands (Kocourková & Knudsen 2009a).

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, on *Caloplaca bolacina*, 14.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915673).

66. *Syzygospora physciacearum* Diederich*

NOTES. – This lichenicolous fungus was collected on *Physcia dimidiata* (Arnold) Nyl. The species is infrequent in southern California. *Physcia dimidiata* is a new host.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N 118°54'35"W, 434 m, on *Physcia dimidiata*, 14.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915675).

67. *Thelenella modesta* (Nyl.) Nyl.

NOTES. – This species is rare in the Santa Monica Mountains.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Mugu State Park, upper La Jolla Valley, 34°6'37"N, 119°01'46"W, 270 m, 13.viii.2009, on *Malacothamnus fasciculatum*, *K. Knudsen 11573 & J. Kocourková* (UCR).

68. *Trapeliopsis steppica* McCune & Camacho

NOTES. – This sorediate species, with distinctive green soredia, is known from two sites in the Santa Monica Mountains. We have also collected it in the Santa Ana Mountains (*K. Knudsen 9277*, UCR).

SPECIMENS EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Malibu Creek State Park, along Backbone Trail, south of Stunt Road, steep north-facing sandstone slabs, 34°4'59"N, 118°40'3"W, 576 m, 9.ix.2006, *K. Knudsen 7718 R. Muertter* (UCR). VENTURA CO.: Point Mugu State Park, ridge between upper La Jolla Valley and Wood Canyon along truck trail, 34°6'39"N, 119°01'36"W, 267 m, 13.viii.2009, *K. Knudsen 11576.2 w/ J. Kocourková & T. Sagar* (UCR).

69. *Verrucaria muralis* Ach.

NOTES. – This species was collected on limestone on ridge above Santa Ynez Canyon.

SPECIMEN EXAMINED. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga State Park, 34°5'41"N, 118°33'4"W, 552 m, on limestone, 6.iv.2008, *K. Knudsen 9553 w/ J. Kocourková & B. Landis* (UCR).

70. *Verrucaria rupicola* (B. de Lesd.) Breuss

NOTES. – This small-spored species was recently revised by Breuss (2007). It was previously collected by Hasse in the Santa Monica Mountains (O. Breuss, pers. comm.).

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Point Magu State Park, Sycamore Canyon. Ranch Center Trail, in hills, 34°8'3"N, 118°58'54"W, 173 m, on sandstone boulder, 2.vi.2009, *K. Knudsen 11234 & T. Sagar* (UCR).

71. *Vouauxiella lichenicola* (Linds.) Petrak & Syd.*

Notes. – This species is frequent on *Lecanora* species in southern California.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, on *Lecanora cicumborealis* on oak, 14.viii.2009, *J. Kocourková & K. Knudsen* (PRM 915674, in specimen of *Lichenodiplis rinodinicola*).

72. *Xanthomendoza fulva* (Hoffm.) Søchting, Kärnefelt & S. Kondr.

Notes. – This is a common species especially on oaks.

Specimens Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga Canyon along Highway 27, 34°7'38"N, 118°35'36"W, 383 m, on *Juglans californica,*15.ix.2004, *K. Knudsen 1548.4* (UCR). VENTURA CO.: Point Mugu State Park, Wood Canyon, 34°7'38"N, 119°0'51"W, 383 m, on *Quercus agrifolia*, 13.viii.2009, *J. Kocourková w/ K. Knudsen & T. Sagar* (UCR).

73. *Xanthomendoza hasseana* (Räsänen) Søchting, Kärnefelt & S. Kondr.

Notes. – This lichen is rare in mixed corticolous communities on oaks in the Santa Monica Mountains.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks: ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen 9614* (UCR).

74. *Xanthoparmelia verruculifera* (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch

Notes. – This lichen occurs in small populations in mixed saxicolous communities.

Specimens Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Leo Carrillo State Park, Nicolas Flat, 34°3'50"N, 118°54'35"W, 434 m, 14.viii.2009, *J. Kocourková & K. Knudsen s.n.* (UCR). VENTURA CO.: Thousand Oaks, near Lake Elenor Dam, Conejo Open Space, slope above Highway 23 South, 34°8'10"N, 118°51'13"W, 296 m, 24.xi.2008, *K. Knudsen 10712 w/ J. Kocourková & T. Sagar* (UCR).

75. *Xanthoria candelaria* (L.) Th. Fr.

Notes. – This common maritime species is rare in the Santa Monica Mountains.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Point Dume Nature Reserve, 34°0'8"N, 118°48'30"W, 10 m, on rock wall, 1.vi.2009, *K. Knudsen 11208 & T. Sagar* (UCR).

76. *Xanthoria parietina* (L.) Th. Fr.

Notes. – This common species is rare in southern California.

Specimen Examined. – **U.S.A. CALIFORNIA**. VENTURA CO.: Thousand Oaks, ranch along Hidden Valley Road, 34°8'30"N, 118°55'6"W, 362 m, on *Quercus agrifolia*, 28.v.2008, *K. Knudsen 9614* (UCR).

III. – Historical Records

1. *Arthonia subdispuncta* Nyl. ex Hasse†

Notes. – This non-lichenized species appears to be restricted to the caudex of *Coreopsis gigantea* and was recently rediscovered on East Anacapa Island (Knudsen 2008). Its type locality was the top of Point Dume, an area almost completely covered with houses, and so far we have not re-collected it in the Santa Monica Mountains. The species appears to need a higher relative annual humidity than is now found in the Santa Monica Mountains and it is for now treated as a historical record (see *A. pinastri* above).

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: bluffs of Point Dume, on *Coreopsis gigantea*, *H.E. Hasse* (FH, PH, NY).

2. *Placopyrenium heppioides* (Zahlbr.) Breuss

Notes. – Hasse collected the only known specimens of this squamulose species in Topanga Canyon in the Santa Monica Mountains. It can be easily mistaken for a *Dermatocarpon* but differs in a number of characters from species in that genus (Breuss 2009). So far we have been unsuccessful in rediscovering *P. heppioides* and it is treated as a historical record.

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga Canyon, *H.E. Hasse* (FH, MIN).

3. *Pseudocyphellaria anomala* Brodo & Ahti

Notes. – This macrolichen is probably extinct in the Santa Monica Mountains and a relic when Hasse discovered it in 1907. It is one of a number of macrolichens, like *Bryoria fremontii* (Tuck.) Brodo & D. Hawksw., that were almost certainly common in southern California during the Pleistocene and maybe into the Little Ice Age that ended in the middle 19th century (Matthes 1939), but have disappeared as the climate has grown warmer and drier. These macrolichens are now common further north in California. Previously, the most southern location of *P. anomala* in California was an unverified collection by C. Bratt from Santa Barbara County (Ryan & Galloway 2002).

Specimen Examined. – **U.S.A. CALIFORNIA**. LOS ANGELES CO.: Topanga Canyon, on rocks, i.1907, *H.E. Hasse* (NY, identified as *Sticta weigelii*).

4. *Sphaerellothecium breussii* K. Knudsen, Kocourk. & Etayo*

Notes. – This lichenicolous fungus was recently described from southern California and is currently known from the Santa Monica Mountains only from historical collections by Hasse (Knudsen et al. 2009). Its host, *Placidium lacinulatum* (Ach.) Breuss, is now infrequent in the Santa Monica Mountains.

5. *Thelenella hassei* (Zahlbr.) H. Mayrhofer
(basionym, *Microglaena hassei* Zahlbr.)

Notes. – This species was collected by Hasse principally on *Juglans californica* as well as on *Prunus ilicifolia* (Nutt.) Walp. (Hasse 1913; Mayrhofer 2002).

6. *Thelenella inductula* (Nyl. ex Hasse) H. Mayrhofer
(basionym, *Verrucaria inductula* Nyl. ex Hasse)

Notes. – This saxicolous species was collected by Hasse, possibly at only one locality several times. (Hasse 1913; Mayrhofer 2002).

7. *Thelenella sychnogonioides* (Zahlbr.) R.C. Harris
(basionym, *Microgleana sychnogonioides* Zahlbr.)

NOTES. – This species was collected by Hasse on the smooth bark of *Quercus agrifolia* and *Juglans californica* (Hasse 1913; Mayrhofer 2002).

CONCLUSION

More than any other mountain range in southern California, the Santa Monica Mountains have been affected by human development. The original biological unity of the mountains has been completely transformed over the last one hundred and fifty years. The Los Angeles-Santa Monica slopes and San Fernando Valley slopes are almost totally subdivided and urbanized. Air pollution has affected parts of the range, sometimes drastically as in the Los Angeles area, especially in the 1950s. Fires have become frequent in most areas. Development continues throughout the range in competition with the acquisition and incorporation of land into the public trust.

Currently, we report 316 taxa comprising 288 lichens, 25 lichenicolous fungi, and 3 allied fungi. We expect this total diversity number to increase for the Santa Monica Mountains as we continue our ongoing inventory.

We are still studying the historic collections of Hasse prior to 1915 and expect the species known only from historic records to easily exceed 50 taxa. We suspect the original total species diversity was much higher at the beginning of 20th century.

We have begun actively collecting lichenicolous fungi in the Santa Monica Mountains. Lichenicolous fungi generally occur in habitats with long ecological continuity (Hawksworth 2003). So far we have reported 25 species with several undescribed species awaiting description. This is less than ten per cent of the total current lichen biota, a percentage we consider too small, indicative of both our limited collecting and of disturbance to habitats. Probably the biggest limiting factor for lichenicolous fungi diversity in the Santa Monica Mountains is increased fire frequency. It is believed fire frequency was probably once as low as every 125 years (John Tiszler, pers. comm.), but now fire frequency in many areas is 20 years or less. While much of the vegetation can rapidly recover from fires we have observed a decrease in corticolous lichen diversity in areas with accelerated fire frequency. In the Santa Monica Mountains many corticolous lichens are relatively rare or possibly extinct, especially those reported by Hasse as common on chaparral (Hasse 1913), and frequently burned areas may be totally lacking in corticolous lichens. This causes a decrease in available hosts for lichenicolous fungi as well as depleting reproductively viable populations of lichenicolous fungi, which are often not abundant even in undisturbed habitats. Fires in areas with heavy chaparral also leads to the decrease in lichens on rock outcrops and boulders, further decreasing populations of saxicolous lichens and their lichenicolous fungi.

Intertidal lichens are proving rare on the southern California coast in undisturbed habitats, with algae dominant. We spent considerable time looking for intertidal lichens along the coast of the Santa Monica Mountains. We found only *Collemopsidium sublitorale* at one site. Overall the shoreline has been heavily disturbed by road building and housing developments.

Like shards, relatively undisturbed microhabitats are scattered across the landscape, some of which were already natural refugia like moist north slopes, rare geological deposits, or old-growth chaparral. These are often rich in lichen species, some which have become relics, either through the randomness of natural history, human intervention, or a combination of both. As collectors, we cannot predict what we may discover on a new rock outcrop, around the next turn on an old abandoned truck trail, or in an old walnut woodland that has escaped fire. Lichenologists who visited the Santa Monica Mountains in the 20th century after Hasse were generally disappointed with the lack of lichen diversity and the development in some habitats like Topanga Canyon often collected by Hasse. But when we drive on freeways through Los Angeles before dawn to beat the traffic, on our way to collect in the Santa Monica Mountains, we are always filled with excitement, wondering what we will discover.

ACKNOWLEDGEMENTS

We thank our reviewers J. Etayo and B. Hodkinson. We thank A.Fryday (MSC) for identifying *Rhizocarpon subpostumum,* C. Gueidan (Centraalbureau voor Schimmelcultures) for sequencing and identifying *Placopyrenium noxium*, J.C. Lendemer (NY) for help in many ways, R. Muertter for pictures of Conejo Mountain and sandstone slabs near Saddle Peak, J.W. Sheard (SASK) for revising *Rinodina* determinations, D. Magney for his support through a donation to the UCR Herbarium, NPS bryologist T. Sagar for guiding us on many of our excursions, B. Landis for showing us calcareous sites, and NPS ecologist J. Tiszler for his constant support of our research. We are grateful to Z.

Pouzar (Praha, CZ) for checking the Latin diagnosis. The work of K. Knudsen was supported by an Academic Fellowship from the Santa Monica Mountains Fund for the continuing study of the lichen biota of the Santa Monica Mountains. The work of J. Kocourková was supported by the Faculty of Environmental Sciences, Czech University of Life Sciences Prague.

Literature Cited

Breuss, O. 2002. *Placopyrenium*. *In:* Nash III, T.H., C. Gries, and F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region. Volume 1. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 393–397.

Breuss, O. 2007 (2008), *Verrucaria*. *In:* Nash III, T.H., C. Gries, and F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region. Volume 3. Lichens Unlimited, Arizona State University, Tempe, pp. 335–377.

Breuss, O. 2009. A synopsis of the lichen genus *Placopyrenium* (Verrucariaceae) with descriptions of new taxa and a key to all species. *In*: Aptroot, A., Seaward, M.R.D. & Sparrius L.B. (eds): Biodiversity and ecology of lichens – Liber Amicorum Harrie Sipman. Bibliotheca Lichenologica, 99**:** 93–112. J. Cramer, Berlin & Stuttgart, 2009.

Christiansen, M.S. 1956. A new species of the form-genus *Lichenoconium* Petr. & Syd. (Fungi Imperfecti), *L. xanthoriae* sp. nov. Friesia, 5(3–5): 212–217.

Diederich, P. 2003. New species and new records of American lichenicolous fungi [Neue Arten und neue Funde von amerkanischen lichenicolen Pilzen]. Herzogia, 16: 41–90.

Diederich, P. 2004. *Abrothallus*. *In:* Nash III, T.H., B.D. Ryan, P. Diederich, C. Gries, and F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 2. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 626–630.

Diederich, P., J. Kocourková, J. Etayo, and M. Zhurbenko. 2007. The lichenicolous *Phoma* species (coelmycetes) on *Cladonia*. The Lichenologist, 39 (2): 153–163.

Egea, J. M., and P. Torrente, P. 1995. Especies saxícolas del género *Arthonia* (Arthoniaceae) en áreas costeras de California y Baja California (Estados Unidos y México). *In:* Daniëls, F.J.A., M. Schulz, and J. Peine (eds.): Flechten Follmann. Contributions to lichenology in Honour of Gerhard Follmann. Geobotanical and Phytotaxonomical Study Group, Botanical Institute, University of Cologne, Cologne, pp. 193–204.

Etayo, J., J. Kocourková, and K. Knudsen 2007. New records of lichenicolous fungi for California. Bulletin of the California Lichen Society, 14(2): 37–39.

Hafellner, J. 2004. *Dactylospora*. *In:* Nash III, T.H., B.D. Ryan, P. Diederich, C. Gries, and F. Bungartz, (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 2. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 645–648.

Hasse, H.E. 1910. Additions to the lichen-flora of southern California, No. 3. The Bryologist, 13: 60–62.

Hasse, H.E. 1913. The lichen flora of southern California. Contributions from the United States National Herbarium, 17: 1–132.

Hawkworth, D.L. 2003. The lichenicolous fungi of Great Britain and Ireland: an overview and annotated checklist. The Lichenologist, 35(3): 191–232.

Hawksworth D.L., and B J. Dyko 1979. *Lichenodiplis* and *Vouauxiomyces*: two genera of lichenicolous Coleomycetes. The Lichenologist, 11: 51–61.

Hawksworth, D.L., and T. Iturriaga. 2008. Lichenicolous fungi described from Antarctica and sub-Antarctic islands by Carroll W. Dodge (1895-1988). Antarctic Science, 18(3): 291–301.

Kainz, C., and D. Triebel. 2004. *Endococcus*. *In:* Nash III, T.H., B.D. Ryan, P. Diederich, C. Gries, and F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 2. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 648–651.

Knudsen, K. 2005. Lichens of the Santa Monica Mountains, Part One. Opuscula Philolichenum, 2: 27–36.

Knudsen, K. 2007. An annotated checklist of the lichens of the Santa Monica Mountains. *In:* Knapp, D.A.: Proceedings of the 32nd Annual Southern California Botanists Symposium. Flora and Ecology of the Santa Monica Mountains. Southern California Botanists Special Publication, No. 4. Fullerton, pp. 35–62.

Knudsen, K. 2008 (2009). The Lichens on San Miguel Island, Channel Islands National Park, California: A Preliminary Checklist. Crossosoma, 34(2): 57–75.

Knudsen, K., O. Breuss, and J. Kocourková. 2009. A New Species of *Placocarpus* (Verrucariaceae) from southern California. The Lichenologist, 41:6:627–630.

Knudsen, K., and J. Kocourková. In press. Lichens and Lichenicolous Fungi of the northwestern Santa Ana Mountains. Crossosoma.

Knudsen, K., J. Kocourková, and J. Etayo. 2009. A new species of S*phaerellothecium* (Mycosphaerellaceae) on *Placidium lacinulatum*. Opuscula Philolichenum, 6: 41–44.

Knudsen, K., and J.C. Lendemer. 2006. *Sarcopyrenia bacillosa* (Nyl. ex Hasse) Nav.-Ros. & Hladun rediscovered in California. Evansia, 23(3): 66–67.

Knudsen, K., and J.C. Lendemer. 2009a. *Cladonia maritima*, a new species in the C. cervicornis group from western North America. Opuscula Philolichenum, 6: 121–124.

Knudsen, K., and J.C. Lendemer. 2009b. Two new species of *Lecanora* with gyrophoric acid from North America. Opuscula Philolichenum, 7: 21–28.

Knudsen, K., B. Owe-Larsson, J.A. Elix, J.C. Lendemer, and J. Kocourková. 2008. Lichens and lichenicolous fungi of the Santa Monica Mountains, Part 3: additions and corrections to the annotated checklist. Opuscula Philolichenum, 5: 53–60.

Kocourková, J. 2000. Lichenicolous fungi of the Czech Republic (the first commented checklist). Acta Musei Nationalis Pragae, Série B, Historia Naturalis, (1999): 59–169.

Kocourková, J. 2009. Observations on the genus *Neolamya,* with the description of the new species *N. xanthoparmeliae* (Ascomycota, genera incertae sedis). Opuscula Philolichenum, 6: 137–148.

Kocourková, J., and K. Knudsen. 2009a. *Stigmidium epistigmellum* (Mycosphaerellaceae), a lichenicolous fungus from maritime *Caloplaca* in North America. The Bryologist, 112 (3): 578–583.

Kocourková, J., and K. Knudsen. 2009b. Three Lichenicolous Fungi new for North America. Evansia, 26 (3): 148–151.

Matthes, F.E. 1939. Report of the committee on glaciers. Tansactions of the American Geophysical Union, pp. 518–523.

Mayrhofer, H. 2002. *Thelenella. In:* Nash III, TH, B.D. Ryan, C. Gries, and F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region. Vol. I. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 479–481.

Ryan, B.D., and D.J. Galloway. 2002. *Pseudocyphellaria. In:* Nash III, T.H., B.D. Ryan, C. Gries, and F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 1. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 413–415.

Sundin, R. 1999. Phylogenetic and taxonomic studies within *Arthonia* Ach. (Ascomycetes, Arthoniales). Botaniska Institutionen, Stockholms Universitet, 88 pp.

Tucker, S.C., and B.D. Ryan. 2006. Revised catalog of lichens, lichenicoles, and allied fungi in California. Constancea, 84: 1–275 + 1–52.

Wetmore, C.M. 1970. The lichen family Heppiaceae in North America. Annals of the Missouri Botanic Garden, 57: 158–209.

Opuscula Philolichenum, **7**: 49-54. 2009.

Cryptothecia evergladensis sp. nov. (Arthoniaceae), a new lichen species from Everglades National Park, Florida

FREDERICK SEAVEY[1]

ABSTRACT. – A new lichenized species of *Cryptothecia* (Arthoniaceae, Arthoniales) is described from Everglades National Park in subtropical Florida. Its description, typification and known distribution are given and its taxonomic position is discussed.

INTRODUCTION

Cryptothecia evergladensis is a common lichen in Everglades National Park. Because of this, I have delayed some years in describing it as new, believing it probably had a name buried somewhere within *Arthothelium* A. Massal. or *Cryptothecia* Stirton of Cuba. I recently had an opportunity of examining new information obtained from various sources and now believe it to be an undescribed species.

MATERIALS AND METHODS

All collections were made by the author and are from Everglades National Park or the adjacent Miccosukee Indian Reservation. Spore and oxalate crystal measurements were made from water mounts under oil immersion lens and rounded to the nearest 0.5 µm. Asci, thalline and ascomatal measurements were made at 400x magnification after the sections were cleared by introducing a 10% solution of potassium hydroxide (KOH) in water. Lugol's solution (0.50%) was used in staining ascomatal and thalline tissue and the results are given as I+ or I-. When pretreated with KOH, the results are given as KI+ or KI-. Photos were taken at various magnifications indicated in the captions. Spore measurements were obtained by selecting 10 collections and removing four sections from the center of two ascogenous areas per collection. Only obviously mature spores were measured. Ascospore and ascus dimensions were consistent among all collections examined and both length and width ranges were narrow. For this reason I am reporting the minimum and maximum ranges of both length and width as being 2 standard deviations below and above the arithmetic mean for all spores measured, rounded to the nearest 0.5 µm, indicating 95% of all ascospores and asci measured fall within those ranges. The smallest and largest measurements are given in parenthesis before and after the range, respectively. Thin layer chromatography was done in accordance with Orange et al (2001) using solvent system C.

RESULTS AND DISCUSSION

The generic delimitations of lichenized mycota within the Arthoniaceae have been less concise and less clearly defined than with many other families. This is particularly true in regards to the generic complexes of *Arthonia/Arthothelium* and *Stirtonia/Cryptothecia*. Commonly used distinctions between the four genera are outlined in the following key:

[1]FREDERICK SEAVEY – South Florida Natural Resources Center, Dan Beard Building, Everglades National Park, Homestead, FL 33034, U.S.A. – e-mail: natureguides@mindspring.com

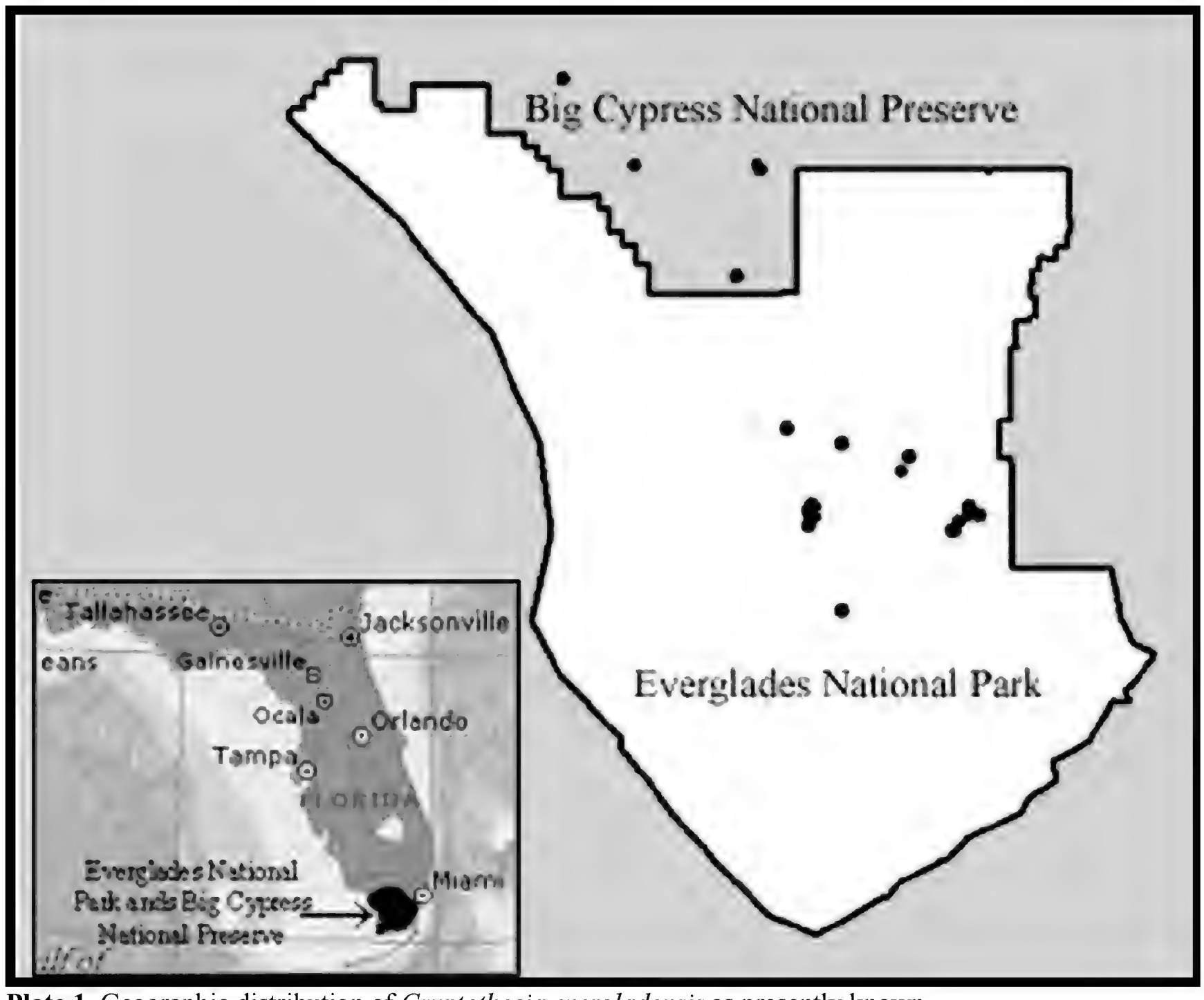


Plate 1. Geographic distribution of *Cryptothecia evergladensis* as presently known.

1. Ascospores transversally septate……2

    2. Hymenium coherent with jelly……*Arthonia*
    2. Hymenium loose or lacking jelly……*Stirtonia*

1. Ascospores muriform……3

    3. Hymenium coherent with jelly……*Arthothelium*
    3. Hymenium loose or lacking jelly……*Cryptothecia*

Although appealingly simple, it is clear that using the above delimitations these genera are unnatural as presently circumscribed, and are in need of thorough revision.

Stirton (1876: 164), in describing *Cryptothecia*, separated it from *Arthonia* Ach. by its having asci "pretty equally distributed throughout the thallus and not congregated in groups so as to constitute true apothecia, ….." Santesson (1952: 64) and others before him expanded the concept of the genus but Santesson admitted to confusion as to the generic limits between *Arthothelium* and *Cryptothecia* by asking "May one ascogonium form only one single ascus in the extreme *Cryptothecia* species, but on the other hand, a whole ascocarp in *Arthothelium*?". Thor (1990) essentially paraphrased Stirton's concept of *Cryptothecia* but went beyond this by stating the distinction between *Arthothelium* and *Cryptothecia* can be difficult especially where asci are aggregated in some areas of the thallus but still not in clearly defined ascomata.

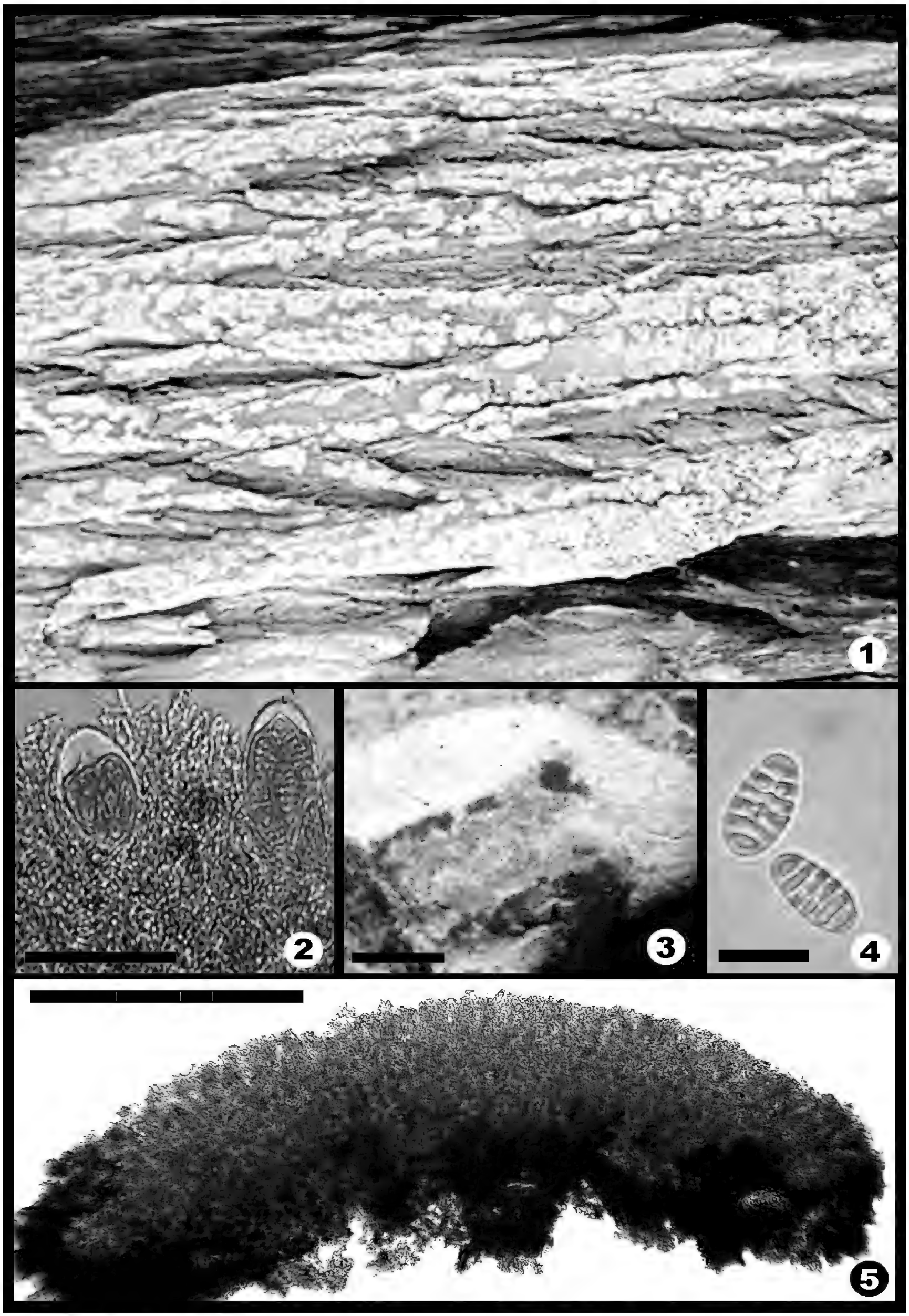


Plate 2. *Cryptothecia evergladensis*. Figure 1, thallus in situ on *Taxodium ascendens* (x 1.5). Figure 2, pyriform to broadly pyriform asci (scale = 25 µm). Figure 3, ascigerous zone with white pruina removed (scale = 3 mm). Figure 4, submuriform ascospores (scale = 10 µm). Figure 5, section of of the light brown ascigerous area shown in Figure 1C above after treatment by 10% KOH. Asci are represented by the numerous lighter areas among the gray paraphysoids. The red-brown hypothecioid zone is paraplechtenchymatic (scale = 1 mm).

Over the past quarter century other authors have added to or sharpened the concept of *Cryptothecia* (Makhija & Patwardhan 1985, 1987; Thor 1990, 1997; Grube 1998; Sparrius 2005; Lücking pers. comm. 2009). Although *Cryptothecia* has been the subject of many other works, a compilation of characters taken from the above authors gives a more or less complete description of the genus as it is currently understood. A paraphrased compilation follows: 1. thallus commonly ecorticate with developed strata absent or rudimentary, I+ blue at least in part; 2. asci randomly dispersed within the thallus or concentrated into ± distinct ascigerous zones (if the latter, then the individual zones separated by hydrophobic plectenchyma but well defined hymenium, hypothecium and exciple tissue normally lacking); 3. asci pyriform to more commonly globose, usually thickened at the apex with a KI+ blue layer (occasionally lacking, e.g. *C. striata* G. Thor); 4. ascigerous areas non-carbonized and lacking hamathecial jelly; 5. ascospores muriform to submuriform. In addition, the position of *Cryptothecia* within the Arthoniales has been characterized in dichotomous key form by Grube (1998). The new taxon described herein closely adheres to the above concept of *Cryptothecia,* keys to that genus in the Grube key and is, therefore, placed in that genus.

Although well organized and sharply delimited ascomata are known within *Cryptothecia* (e.g. *C. candida* (Kremp.) R. Sant. and *C. filicina* (Ellis & Everh.) Lüching & G. Thor), the somewhat differentiated hypothecium of *C. evergladensis* might suggest placement in *Arthonia* or *Arthothelium*. However, the lack of hamathecial jelly, the presence of hydrophobic plectenchyma, and a chemistry atypical of *Arthonia* support inclusion in *Cryptothecia.* Additionally, absence of pycnidia, absence of an epithecial layer or dark paraphysoid caps and submuriform ascospore septation (admittedly weak characters when taken separately) when taken together suggest that *Arthonia*, as currently described, would be a poor fit. The same characters, plus paraphysoids which at best are only loosely arranged around the asci (figures 1 & 2), make *Arthothelium* an even more unlikely fit.

The New Species

***Cryptothecia evergladensis* Seavey sp. nov.**

Mycobank #515450.

Thallus crustaceus, continuus, ecorticatus, laevis vel verruculosus, byssaceus, 80-180 µm crassus. Asci aggregati in ascomatis distinctis pallide bruneolis cum pruina albida. Ascosporae 8, decolores, submuriformes, ovoideae, 14-18 x 7-10 µm. Acidum psoromicum, acidum 2-O-methylperlatolicum continens cum vel sine lichexanthono.

TYPE: **U.S.A. FLORIDA**. MIAMI-DADE CO.: Everglades National Park, ca 2.3 km SW of Pa-Hay-Okee Overlook, inundated cypress strand, 5.v.2004, *F. Seavey 2894E* (FNPS, holotype).

Description. – Thallus corticolous, crustose, pale bluish-gray to pale tan, epiphloeic, ecorticate, continuous, effuse, 80-180 µm thick; surface glaucous and often with a thin white pruina, smooth to verruculose; byssoid without soredia or isidia; often forming large irregularly shaped patches to 20 cm long and wide, consisting of loosely interwoven hyphae and algal cells with little or no differentiation between the surface and a medullary layer, reacting I+ and KI+ faint blue. Thallus evenly inspersed with abundant yellowish (polarized light) oxalate crystals, 2-12 µm, roundish to irregular and insoluble in K, soluble in 25% H_2SO_4; white to brown prothallus occasionally present. Asci loosely entwined by paraphysoids and concentrated in pale brown ascigerous areas which are irregular in shape, immersed and indicated by a normally thick white pruinose cover, the whole slightly or significantly elevated above the thallus surface. Ascigerous layer 50-100 µm high, composed of hyaline, strongly anastomosing paraphysoids, I-, KI+ blue except the extreme upper part KI-; subtended by a brown hypothecioid zone of paraplectenchymatous cells 95-145 µm thick, I+ blue, KI+ blue. Asci pyriform to broadly pyriform, 8 spored, ± randomly dispersed throughout ascigerous zone, (36)38-50(55) x (14)16-22(24) µm, thickened at the apex, KI-. Ascospores hyaline, ovoid, submuriform with 5 evenly spaced transverse septa, the mid 2-4 cells once vertically septate, (13)14-17.5(19) x (6.5)7.5-9.5(10) µm, remaining essentially hyaline in post maturity. Neither

pycnidia nor acervuli were detected. Photobiont: *Trentepohlia*, cells mostly single, occasionally in clusters, rarely in short chains, broadly oblong, 8-12 x 7-9.5 µm.

CHEMISTRY. – Of 10 collections analyzed all had psoromic acid (P+ yellow) but occasionally only in trace amounts. 2-O-methylperlatolic acid was major in all but two collections. Lichexanthone was present but frequently only as a trace. Thallus UV+ yellow when lichexanthone present in sufficient amounts. Pruina covering ascigerous areas, UV+ bright white.

DISTRIBUTION AND HABITAT. – At present most collections have been found in the cypress zone of Everglades National Park and the south central portion of Big Cypress National Preserve. I have not encountered it north of U.S. Highway 41 (Tamiami Trail) nor west of the band of cypress that extends in a north/south direction through Big Cypress and Everglades National Park. On the east side of that zone it has been collected from nearby hammocks (islands of broad leaf trees). *Taxodium* bark is by far the most common substrate but collections also have been made from *Metopium toxiferum* (1), *Sideroxylon salicifolia* (2), *Ateramnus lucida* (2), *Lysiloma latisiliquum* (1), and several from the lignum of *Conocarpus erectus*.

DISCUSSION. – *Cryptothecia evergladensis* is recognized by its glaucous bluish-gray to greenish-gray thallus reacting P+ yellow and usually UV+ yellow, distinct light brown ascigerous zones covered by white pruina (UV+ white) and its small hyaline, submuriform ascospores. Currently, two other *Cryptothecia*, *C. striata* and *C. rubrocincta* (Ehrh.:Fr) G. Thor, are recognized from south Florida. The latter has recently been transferred to the genus *Herpothallon* Tobler by Aptroot et al. (2009) as *H. rubrocinctum* (Ehrenb.:Fr) Aptroot et al., but is easily separated from other North American *Cryptothecia* by being always sterile, having a bright red prothallus and bright red patches dispersed over the thallus (chiodectonic acid, K+ purple). It also contains confluentic acid. *C. striata* is superficially somewhat similar to *C. evergladensis* but its ascospores are much larger (55-70 x 23-29 µm) and muriform and its asci are usually scattered in radiating or irregular lines and do not form distinct white patches. In addition, it lacks the chemistry of *C. evergladensis* and contains only gyrophoric acid (C+ red).

SPECIMENS EXAMINED. – **U.S.A. FLORIDA**. MIAMI-DADE CO.: near Coe cypress dome, 25°20'N, 80°39'W, 9.i.2005, *F. Seavey 493E* (FNPS); cypress dome east of gated section of Ingraham Highway, 25°21'N, 80°37'W, 31.i. 2008, *F. Seavey 1891E* (FNPS); north of Sissal Hammock, 25°24'N, 80°47'W, 2.ii.2005, *F. Seavey 516E* (FNPS); Jones Hammock, 25°25'N, 80°43'W, 29.xii.2008, *F. Seavey 2541E* (FNPS); 1 km. south of Ficus Pond, 25°21'N, 80°50'W, 28.iii.2005, *F. Seavey 576E* (FNPS); 2 km. south of Nine Mile Pond, 25°14'N, 80°48'W, 11.iv.2005, *F. Seavey 617E* (FNPS); Robertson Hammock, 25°26'N, 80°43'W, 7.xii.2008, *F. Seavey 2853E* (FNPS); 1.6 km. west of main park road, 25°21'N, 80°50'W, 3.ii.2006, *F. Seavey 737E* (FNPS); Deer Hammock, 25°24'N, 80°43'W, 15.i.2009, *F. Seavey 2557E* (FNPS); MONROE CO.: Miccosukee Indian Reservation, 25°45'N, 80°54'W, 16.iv.2008, *F. Seavey 2170M* (FNPS).

ACKNOWLEDGEMENTS

I thank various departments within Everglades National Park for their contributions of supplies and funding. Richard Harris and Robert Lücking are gratefully acknowledged for viewing specimens and sharing their knowledge concerning *Cryptothecia*. Robert Lücking and Harrie Sipman made valuable suggestions and additions to the manuscript. James Lendemer was very helpful with Latin nomenclature.

LITERATURE CITED

Aptroot, A., G. Thor., R. Lücking, J.A. Elix, and J.L. Chaves. 2009. The lichen genus *Herpothallon* reinstated. *In* Aptroot, A., M.R.D. Seaward, and L.B. Sparrius. Biodiversity and ecology of lichens: liber amicorum Harrie Sipman. Bibliotheca Lichenologica, 99: 19–66.

Grube, M. 1998. Classification and phylogeny in the Arthoniales (Lichenized Ascomycetes). The Bryologist, 101: 377-391.

Makhija, U., and P.G. Patwardhan. 1985. A contribution to our knowledge of the genus *Cryptothecia*. Biovigyanam, 11(1): 1-13.

Makhija, U., and P.G. Patwardhan. 1987. Materials for a lichen flora of the Andaman Islands. II. The genera *Cryptothecia* and *Stirtonia*. Biovigyanam, 13(2): 43-51.

Orange, A., P.W. James, and F.J. White. 2001. Microchemical methods for the identification of lichens. British Lichen Society. 101 pp.

Santesson, R. 1952. Foliicolous Lichens 1. A revision of the taxonomy of the obligately foliicolous, lichenized fungi. Symbolae Botanicae Upsaliensis, 12(1): 1-590.

Sparrius, L.B., and W. Saipunkaew. 2005. *Cryptothecia punctosorediata*, a new species from northern Thailand. Lichenologist, 37(6): 507-509.

Stirton, J. 1876. Description of recently discovered foreign lichens. Proceedings of the Philosophical Society, 10: 156-164.

Thor, G. 1990. The lichen genus *Chiodecton* and five allied genera. Opera Botanica, 103: 1-92.

Thor, G. 1991. The placement of *Chiodecton sanguineum* (syn. *Chiodecton rubrocinctum*), and *Cryptothecia striata* sp. nov. The Bryologist, 94(3): 278-283.

Thor, G. 1997. The genus *Cryptothecia* in Australia and New Zealand and the circumscription of the genus. *In:* Tibell, L., and I. Hedberg (eds.): Lichen Studies Dedicated to Rolf Santesson. Symbolae Botanicae Upsalienses, Acta Universitatis Upsaliensis, Uppsala, pp. 267-289.

Opuscula Philolichenum, **7**: 55-60. 2009.

The lichen genus *Syncesia* (Arthoniales) on Saba and St. Eustatius (West Indies)

Harrie Sipman[1]

ABSTRACT. – Four species of the lichen genus *Syncesia* Taylor (Arthoniales, Roccellaceae) are reported from the little Caribbean islands Saba and St. Eustatius: *S. farinacea*, *S. glyphisoides*, *S. graphica*, and the new species *S. subintegra*, for which a description is provided. Notes on morphology and habitat, and a key are given.

Introduction

Syncesia Taylor is a widespread lichen genus occurring mainly on mature tree trunks in tropical forests. It is often found on vertical or somewhat overhanging faces, where the thalli seem to be protected from direct rain impact and strong sunshine, and it avoids very shady situations. The genus seems more frequent in dry, more or less deciduous tropical forests, like on the Caribbean islands, and less common in rain forests or plantations.

Although its species often cover large parts of the trunks, they have received little attention. Taylor (1836) already proposed a separate genus *Syncesia* for them, but his suggestion was not followed, and they were included in Chiodecton Ach. in the Zahlbrucknerian system (e.g., Zahlbruckner 1926). Tehler (1997) resurrected the genus, and provided a monograph with key and detailed descriptions. *Syncesia* resembles *Chiodecton* because the ascomata do not develop single discs, as in, e.g., the related genus *Dirina* Fr., but they develop groups of discs by subdivision (merocarps). In *Chiodecton* the ascomata remain rounded and of limited size and the merocarps consist of black, punctiform, immersed discs without own margin. In *Syncesia*, however, the ascomata form smaller or larger, poorly delimited aggregates of sessile, rounded to elongate merocarps, each with a brownish disc and a usually well developed, paler margin (Tehler 1997, Thor 1990). Young ascomata show how the primary disc becomes stellately branched (Plate 1, figure 5), and falls apart in smaller discs which develop their own margin but remain aggregated (Plate 1, figure 6). Also in the genera *Enterographa* Fée and *Sclerophyton* Eschw. (Sparrius 2004), both belonging to the Roccellaceae, there is a tendency for the ascomata to split into merocarps, but here the merocarps are usually immersed in undifferentiated thallus patches and arranged in winding lines. In those species, where the merocarps occur in swollen, modified thallus parts, they are still arranged in winding lines, unlike in *Chiodecton* or S*yncesia*.

A botanical exploration of the small Caribbean islands Saba and St. Eustatius, organized by Conservation International and the New York Botanical Garden (http://sweetgu -m.nybg.org/saba/index.html), which included lichens (Sipman 2007), revealed that various groups of Arthoniales are abundant and include many poorly- or unknown taxa. As a first result of the evaluation of the collected samples, a new species of *Eremothecella* Syd. & P. Syf. was described (Sipman 2008). Here attention is paid to the genus *Syncesia*, which is well represented and occurs not only on trunks of large trees in the woodlands, but also on volcanic rock. The ample collections that were made provided a great opportunity to study the diversity of this group and the delimitation of its species. The results are presented here in the form of a key and short descriptions. The most notable is an unusual species with scarcely divided ascomata, which is described here as new. Moreover the taxonomy of the genus appears not fully clear and some of the published species delimitations may need revision. Morphological properties were found to be particularly variable and the entities distinguished below are based mainly on chemical differences.

[1]Harrie Sipman – Botanischer Garten & Botanisches Museum, Freie Universitaet Berlin, Koenigin-Luise-Strasse 6-8, D-14195 Berlin, Germany. – e-mail: h.sipman@bgbm.org

Materials and Methods

The specimens used for this study are deposited in B and NY. They were investigated in the usual way with a stereoscope and compound light microscope. Measurements are made on dry thalli or tap water mounts. Iodine staining is by Lugol's solution without pretreatment by KOH solution. TLC procedures follow Orange et al. (1992), using solvent systems A, B' and C, observation with long-wave and short-wave UV-light, water spraying for the observation of fatty substances, and charring with diluted sulphuric acid. The results are indicated in brackets in abbreviated form with the specimens. The presence of gyrophoric acid was only accepted as certain when on the same plate samples with lecanoric and gyrophoric acid were run. In other cases a question-mark was added as confusion with lecanoric acid or other depsides cannot be excluded. Spot tests were restricted to C, which is a reliable indicator for the presence of erythrin (C+ deep red) or gyrophoric acid (C+ pale red). The presence of protocetraric acid would result in a positive P-reaction; thus this could be added as a character for all species containing this substance. No substances were found which can be reliably indicated by the K-reaction, and this is likely to give an unspecific, yellowish to brownish color in all species. The rather erratic observation of fatty acids may depend to some extent on the reduced accuracy of the followed TLC procedure for this group of substances.

Results

I. - Key to the Species

1. On rock; thallus verrucose……..……..*S.* cf. *farinacea*
1. On bark; thallus smooth……..…2

2. Merocarp discs often over 0.5 mm wide, mainly isodiametric; ascomata with few merocarps or remaining simple…..……..*S. subintegra*
2. Merocarp discs about 0.2 mm wide, often elongate; ascomata becoming subdivided into groups of many merocarps……..3

3. Thallus C+ red, white……*S. graphica*
3. Thallus C-, usually gray……..…4

4. Thallus UV+ yellow……..……..*S. glyphisoides*
4. Thallus UV-……..*S. farinacea*

II. – Taxonomic Treatment

1. *Syncesia farinacea* (Fée) Tehler

Description. – Thallus smooth to warty, not felty (warts ca. 0.5 mm wide, dense); ascomata ca. 2 x 2-4 mm wide, round to elongate, flat to convex with constricted base, disc deeply lobed, but scarcely subdivided; hymenium clear, I+ reddish; ascospores 35-50 x 4-5 µm.

Chemistry. – Spot test: thallus C- or C+ yellow; fluorescence (350 nm): UV-; TLC: protocetraric acid, sometimes with roccellic acid and/or other fatty substances that run low on TLC plates. An occasional collection contained in addition gyrophoric acid without giving a positive C-reaction, and two collections lacked protocetraric acid.

Habitat. – The specimens from St. Eustatius were found at ca. 20-400 m, on trunks in semi-evergreen seasonal and in humid evergreen forest. Reported phorophyte: *Tabebuia pallida*. The specimens from Saba, however, are saxicolous from walls of stapled andesite blocks in cultivated fields, and from low outcrops in bush land around 500 m elevation.

Discussion. – The identifications are provisional, because the spore length exceeds that indicated by Tehler (1997). However, one of the available specimens has been identified by the monographer. Our material has a considerable resemblance with *Syncesia myrticola* and would seem to fit within the range of

variation of this mainly European species, which has been reported from as close as the Azores. More research on their delimitation may be needed.

Buck 53077 deviates morphologically because the merocarps do not develop strong margins. In this respect it resembles the material of *Syncesia glyphysoides* (*H. Sipman 54688*), but differs by the absence of lichexanthone.

The saxicolous specimens deviate by their warty thallus and convex to semiglobose ascomata. The thallus warts are ca. 0.5 mm wide and dense. The ascomata are ca. 2 x 2-4 mm, round to elongate, convex with constricted base, the disc deeply lobed, but scarcely divided; the iodine-reaction of the hymenium is without blue staining and the ascospores measure 36-48 x 5 µm. The specimens all contain roccellic acid, which is absent in the epiphytic specimens. Since the habitat difference is accompanied by a chemical difference, genetic differences between the populations on both islands are likely, but it remains unclear if it concerns populations from the same, variable species or from different species. Two saxicolous species of *Syncesia* are known so far (Tehler 1997). The exclusively saxicolous *S. sulphurea* (Vain.) Tehler differs clearly by its smaller ascospores, 27-28 x 5 µm, the absence of fatty acids and the presence of atranorin and an unknown substance causing a UV+ cream fluorescence. The occasionally saxicolous *S. myrticola* (Fée) Tehler is a European species, though extending to the Azores. Since the Antillean saxicolous material was found only on one island, it is provisionally retained in *S. farinacea*, to which a specimen (*Sipman 15242*) was attributed by Tehler (1997).

Specimens Examined. – **SABA:** along path Windwardside-Rendez Vous, 12.viii.1980, *H. Sipman 15242* (U; det. A. Tehler); Sandy Cruz Trail, near trailhead at Upper Hell's Gate, 9.iii.2007, *H. Sipman 54843* (B, NY; protocetraric, roccellic, low fatty acids); North Coast trail from parking area in Lower Hell's Gate to Crab Rock, mostly within Saba National Park, 15.viii.2006, *W.R. Buck 50913* (NY; protocetraric, roccellic, low fatty acids); Trailhead of Sandy Cruz Trail from Upper Hell's Gate, 9.viii.2006, *W.R. Buck 50584* (NY; roccellic, low fatty acids), *W.R. Buck 50559* (NY; roccellic, low fatty acids). **ST. EUSTATIUS:** Quill National Park, Quill Trail, between Around-the-Mountain Trail and crater rim, and Mazinga trail, 30.i.2008, *W.R. Buck 53077a* (B, NY; protocetraric); Quill Crater rim between Quill Trail and Mazinga, 30.i.2008, *H. Sipman 56713* (B, NY; protocetraric); Around-The-Mountain Trail, from Quill Trail to White Wall, 29.i.2008, *H. Sipman 56667* (B, NY; protocetraric, gyrophoric, low fatty acid, traces); Quill Trail, lower part till Around-The-Mountain Trail, 29.i.2008, *H. Sipman 56627* (B, NY; protocetraric, low fatty acid, traces).

2. *Syncesia glyphysoides* (Fée) Tehler

Description. – Thallus smooth, not felty, sometimes with marginal, black pycnidia; ascomata ca. 2 x 2-4 mm wide, round to elongate, sessile, flat with not constricted base, disc deeply lobed, but scarcely divided; hymenium clear, I+ reddish, base spotwise pale blue; ascospores 38-43 x 5 µm.

Chemistry. – Spot tests: thallus C-; fluorescence (350 nm): UV+ yellow; TLC: lichexanthone, roccellic, protocetraric acids.

Habitat. – Found in the hills at 10-400 m, on trunks in semi-evergreen, seasonal and secondary forest. Reported phorophyte: *Tabebuia pallida*.

Discussion. – Our material deviates from the description of Tehler (1997) by the absence of atranorin and presence of lichexanthone. It is assumed here that the indication of atranorin by Tehler (1997) is based on confusion with lichexanthone, which does more easily explain the fluorescence of the species.

Specimens Examined. – **SABA:** beginning of Sandy Cruz Trail at The Bottom, 5.iii.2007, *H. Sipman 54688* (B, NY; lichexanthone, protocetraric, roccellic). **ST. EUSTATIUS:** NW-slope of the Quill volcano, above Round Hill, 9.viii.1980, *H. Sipman 15150* (U; det. A. Tehler 1995).

3. *Syncesia graphica* (Fr.) Tehler

Description. – Thallus smooth, not felty; ascomata ca. 2 x 2-10 mm wide, round to elongate, flat to convex with constricted base, disc much divided in margined, round to elongate or deeply lobed merocarps, when young deeply lobed, stellate; hymenium clear, I+ reddish, sometimes blue near the base; ascospores 42-55 x 5 µm.

Chemistry. – Spot tests: thallus C+ red; fluorescence (350 nm): UV-; TLC: roccellic, tr. gyrophoric? (absent in *W.R. Buck 51296*), protocetraric (absent in *H. Sipman 54754*) acids, erythrin, indet. substances.

Habitat. – Found in the higher parts of the islands, around ca. 300 m, on trunks in semi-evergreen forest. Reported phorophytes: *Bursera cordifolia*, *Pisonia* sp. and *Tabebuia heterophylla*.

Discussion. – The spore size is slightly larger than 31-36 µm long as indicated by Tehler (1997). This is in accordance with other specimens in B, which also exceed this length.

Specimens Examined. – **SABA:** Spring Bay Trail from trailhead in English Quarter to talus slope, 16.viii.2006, *W.R. Buck 50940* (NY; erythrin, trace of gyrophoric?, trace of protocetraric, roccellic, traces); St. John's, Thais Hill, 6.iii.2007, *W.R. Buck 51296* (NY; erythrin, traces of protocetraric, roccellic); along road Windwardside-The Bottom, between Peak Hill and St. John's Hill, 13.viii.1980, *H. Sipman 15310* (U; det. A. Tehler 1995); Thais Hill near St. John's, 6.iii.2007, *H. Sipman 54754* (B, NY; erythrin, trace of gyrophoric?, roccellic, traces); Thais Hill near St. John's, 6.iii.2007, *H. Sipman 54755* (B, NY; erythrin, gyrophoric?, trace protocetraric, roccellic, traces); Dancing Place trail near Windwardside, end, 12.iii.2007, *H. Sipman 54985* (B, NY; erythrin, trace of gyrophoric, trace of protocetraric, roccellic, traces), *H. Sipman 54995* (B, NY; erythrin, trace of gyrophoric?, trace of protocetraric, roccellic, traces), *H. Sipman 54997* (B, NY; erythrin, trace of gyrophoric?, trace of protocetraric, rocellic, traces). **ST. EUSTATIUS:** Quill National Park, Quill Trail, between Around-the-Mountain Trail and crater rim, and Mazinga trail, 30.i.2008, *W.R. Buck 53077* (NY); SW-slope of the Quill volcano, 7.viii.1980, *H. Sipman 15132* (B).

4. *Syncesia subintegra* Sipman sp. nov.

Mycobank #515406.

A Syncesia graphica compositione chimica simile differt ascomatibus subintegris et ascosporis minoribus.

TYPE: **ST. EUSTATIUS:** Botanical Garden, along Birds Trail until Round-The-Mountain Trail. Elev. 70-100 m. 17° 28,5' N, 62° 57,1' W. Disturbed thorny woodland and transition to deciduous seasonal forest on E-slope of Quill. 31.i.2008, *H. Sipman 56775* (NY, holotype; B, isotype; TLC: erythrin, gyrophoric?, protocetraric acids, traces).

Description. – Thallus corticolous, ashy white, several cm or even over 1 dm in diam., with slightly rugulose surface, rugules in part slightly radiating; towards the margin more distinctly radiose, and marginally with a ca. 1 mm wide, filamentose, brownish prothallus where bordering bare treebark, prothallus more or less reduced where bordering lichen thalli; thallus in section to ca. 0.1 mm thick, epiphloeodic, composed of a dense mixture of algal cells, hyphae and fine crystals (dissolving in KOH), ca. 50 µm thick, towards the base consisting of more loose hyphae only. Ascomata absent from a marginal zone of ca. 5 mm, abundant in the thallus center, 0.2-1(-2) mm wide, round to elongate, flat, immersed to emergent, eventually with constricted base, disc rounded or somewhat elongate, scarcely dividing, with sterile, white strands penetrating from the margin; hymenium ca. 70 µm high, inspersed with crystals dissolving in KOH, I+ reddish; ascospores 25-28 x 4-5 µm. Pycnidia not seen.

Chemistry. – Spot tests: thallus C+ red; fluorescence (350 nm): UV-; TLC: roccellic (absent in *H. Sipman 54982*), tr. gyrophoric?, protocetraric acids, erythrin, traces of indet. substances.

Habitat. – Found at middle elevations, at ca. 100-300 m, on trunks in dry to semi-evergreen forest and its degradation stages. Reported phorophytes: *Pisonia* sp., *Tamarindus indica*.

Discussion. – The new species deviates most conspicuously from all other *Syncesia* species by its ascomata producing few, large merocarps, which become mostly over 0.5 mm wide and are isodiametric to short-elongate. Some sterile strands may penetrate from the margin, but usually do not divide the hymenium completely. In other *Syncesia* species the merocarps are about 0.2 mm wide when isodiametric, but are often much longer when elongate. Otherwise the new species fits well in the genus *Syncesia* by its spore form, hypothecium color and epithecium structure. Chemically the new species agrees with *S. graphica* by the presence of erythrin, unknown from other *Syncesia* species (Tehler 1997). That species differs, apart from the ascoma type, by the larger ascospores (31-36 µm long according to Tehler (1997), 42-55 µm in our material, see above).

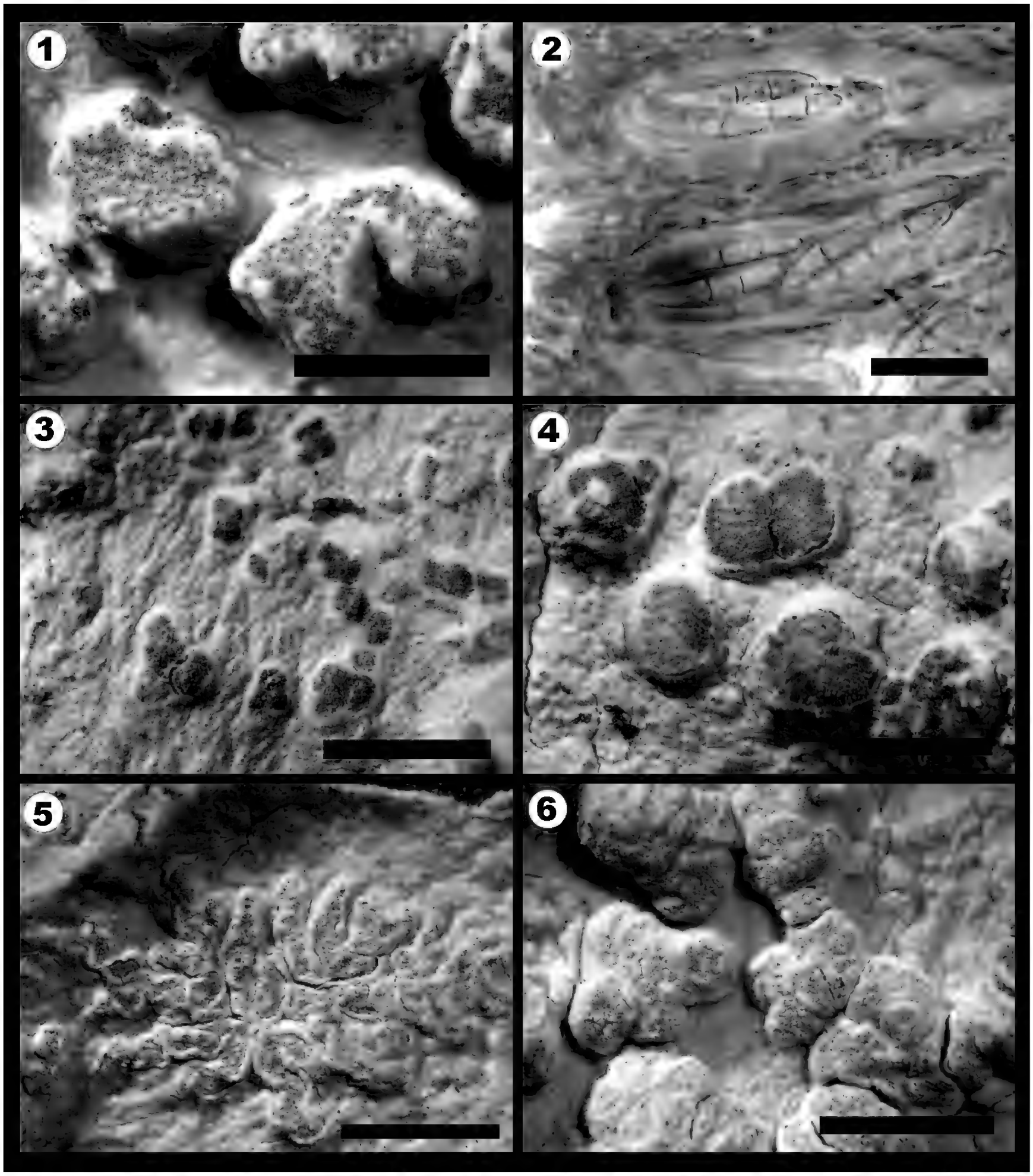


Plate 1. *Syncesia subintegra* (figures 1-4). Figure 1, aged tall ascomata (*Buck 51355*; scale = 1 mm). Figure 2, asci with spores (holotype; scale = 20 µm). Figure 3, young ascomata (holotype; scale = 1 mm). Figure 4, full grown ascomata (holotype; scale = 1 mm). *Syncesia graphica* (figures 5-6). Figure 5, young, stellate ascoma (*Sipman 54754*, scale = 1 mm). Figure 6, aged ascomata (*Sipman 54754*, scale = 1 mm).

Specimens Examined. – **SABA:** North Coast trail from parking area in Lower Hell's Gate to Crab Rock, 15.viii.2006, *W.R. Buck 50889* (NY), *W.R. Buck 50898* (NY; erythrin, roccellic, trace of gyrophoric?, trace of protocetraric, traces); Paris Hill, SW of hospital (Mrs. A. M. Edwards Medical Centre) in The Bottom, 7.iii.2007, *W.R. Buck 51335* (NY; erythrin, trace of gyrophoric, protocetraric, indet.); Dancing Place trail near Windwardside, end, 12.iii.2007, *H. Sipman 54982* (B, NY; erythrin, trace of gyrophoric, trace of protocetraric, traces), *H. Sipman 54987* (B, NY; erythrin, trace of gyrophoric, trace of protocetraric, traces), *H. Sipman 54996* (B, NY; erythrin, trace of gyrophoric, trace of protocetraric, roccellic, traces). **ST. EUSTATIUS:** Quill National Park, Quill Trail and Around-the-Mountain Trail, 29.i.2008, *W.R. Buck 52982* (NY; erythrin, trace of gyrophoric, protocetraric, indet.); SE corner of the island, Botanical Garden Trail from Miriam C. Schmidt Botanical Garden to jct with Around-the-Mountain Trail, 31.i.2008, *W.R. Buck 53127* (NY; erythrin, trace of gyrophoric?, protocetraric, indet.); Quill Trail, lower part till Around-The-Mountain Trail, 29.i.2008, *H. Sipman 56657* (B, NY; erythrin, gyrophoric?, protocetraric, traces).

Acknowledgements

The team during the fieldwork in 2007 and 2008 is gratefully acknowledged for pleasant company, including NY botanists Carol Gracie, Brian Boom, and in particular Scott Mori who was so kind to invite me to participate in the exploration of Saba and St. Eustatius, and Bill Buck, who contributed many valuable lichen collections. Likewise is the team of the late Prof. Ton Stoffers during an expedition in 1980, including Pauline Wiersma and Michiel van Slageren, and several local guides. Conservation International kindly provided financial support.

Literature Cited

Orange, A., P.W. James, F.J. White. 2001. Microchemical Methods for the Identification of Lichens. British Lichen Society. 101 pp.

Sipman, H. 2007. Lichens (http://sweetgum.nybg.org/saba/lichens.html) in the Plants and Lichens of Saba (http://sweetgum.nybg.org/saba/). Virtual Herbarium of The New York Botanical Garden.

Sipman, H. 2008. A remarkable new lichen from the Netherlands Antilles, *Eremothecella microcephalica*. Abhandlungen aus dem Westfälischen Museum für Naturkunde, 70(3-4): 465-469.

Sparrius, L.B. 2004. A Monograph of *Enterographa* and *Sclerophyton*. Bibliotheca Lichenologica, 89, J. Cramer, Berlin, Stuttgart. 141 pp.

Tayor, T. 1836. The Musci, Hepaticae and Lichens. pp. 1-156 *in*: J.T. Mackay (ed.), Flora Hibernica 2.

Tehler, A. 1997. Syncesia (Arthoniales, Euascomycetidae). Flora Neotropica, 74, New York Botanical Garden (for Organization for Flora Neotropica), New York. 48 pp.

Thor, G. 1990. The lichen genus Chiodecton and five allied genera. Opera Botanica, 103: 1-92.

Zahlbruckner, A. 1926. Spezieller Teil. pp. 61-263 *in*: A. Engler & K. Prantl (eds.), Die Natürlichen Pflanzenfamilien. T. 8. Engelmann, Leipzig.

Opuscula Philolichenum, **7**: 61-64. 2009.

Sarcogyne algerica H. Magn., New to Europe

KERRY KNUDSEN[1] & JAVIER ETAYO[2]

ABSTRACT. – *Sarcogyne algerica* is reported for the first from Europe based on specimens from Spain.

INTRODUCTION

Sarcogyne Flot., as currently circumscribed, includes all species of Acarosporaceae lacking a thalline margin except for those with carbonized epihymenial accretions, which are currently included in *Polysporina* Vězda. The generic type is *S. corrugata* Flot. (= *S. clavus* (DC.) Kremp.) (Jørgensen & Santesson 1993). However, the genus is plagued by nomenclatural and typificational confusion and is in need of global revision. Some species are known only from their types, while the types for other species are definitely missing (Knudsen & Standley 2007; Lendemer et al. 2009). The Acharian type of *S. privigna* (Ach.) A. Massal. is an *Acarospora* A. Massal. and the name is currently applied to at least two different taxa based on unpublished work (Knudsen & Standley 2007). *Sarcogyne regularis* Körb. and *Acarospora glaucocarpa* (Ach.) Körb. are closely related and should eventually be segregated into a new genus (Reeb et al. 2004) including *A. badiofusca* (Nyl.) Th. Fr. (Martin Westberg, pers. comm.), but the delimitation of this new genus is problematic. *Acarospora badiofusca* is possibly heterogeneous, needing revision. While the core group of *Sarcogyne* has carbonized exciples and *S. regularis* has a non-carbonized exciple, there are *Sarcogyne* species with intermediate exciples that have various degrees of melanization with or without the death of hyphae, like *S. similis* H. Magn.

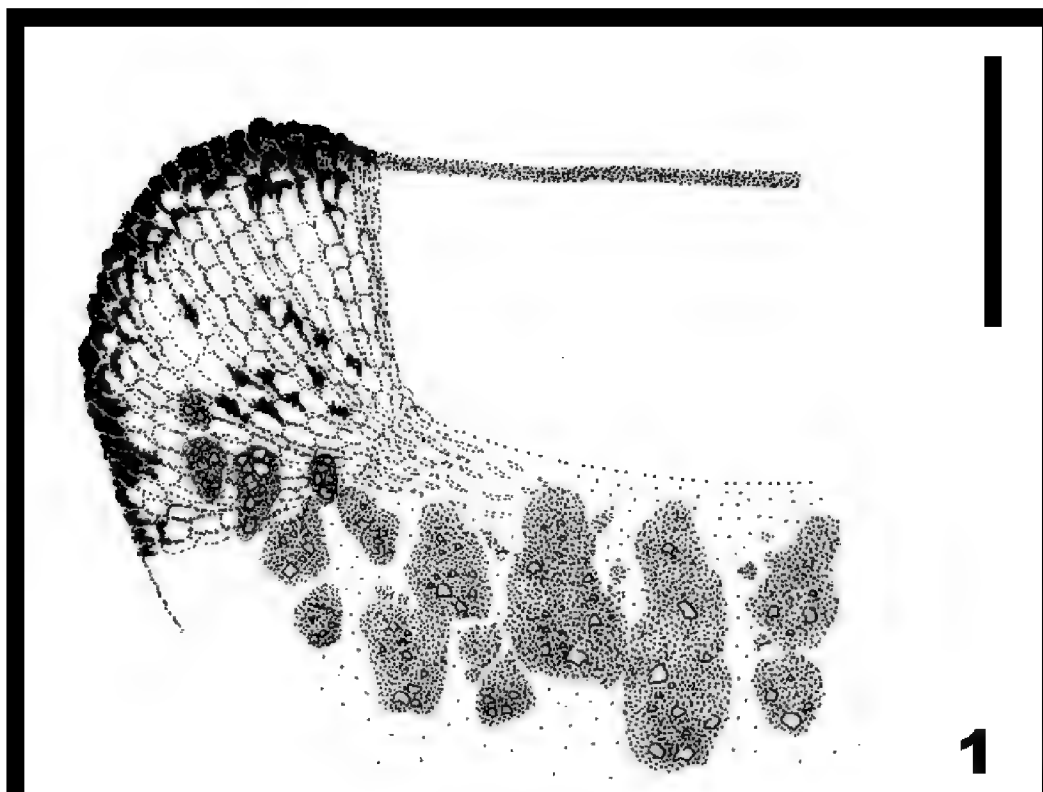
In this paper, we report *Sarcogyne algerica* H. Magn. new to Europe. It is one of the species previously known only from its type. It belongs to the *S. regularis* group with a non-carbonized exciple. As is the case with other species of *Sarcogyne*, the taxonomy of *S. regularis* is extremely complex. There are some varieties with broad apothecia (1-2 mm in diameter) that could be confused with *S. algerica*—for instance var. *platycarpoides* (Anzi) Golubk. and var. *macroloma* (Flörke ex Körb.) Golubk.—but their ascospores are small and of similar size to typical *S. regularis*.

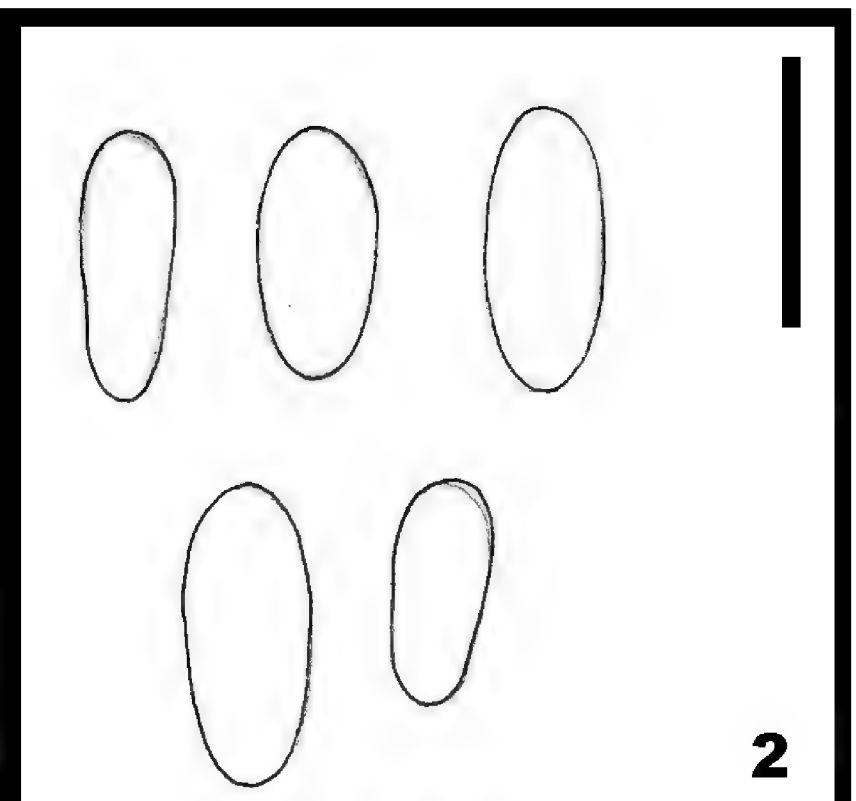
REPORT AND DISCUSSION

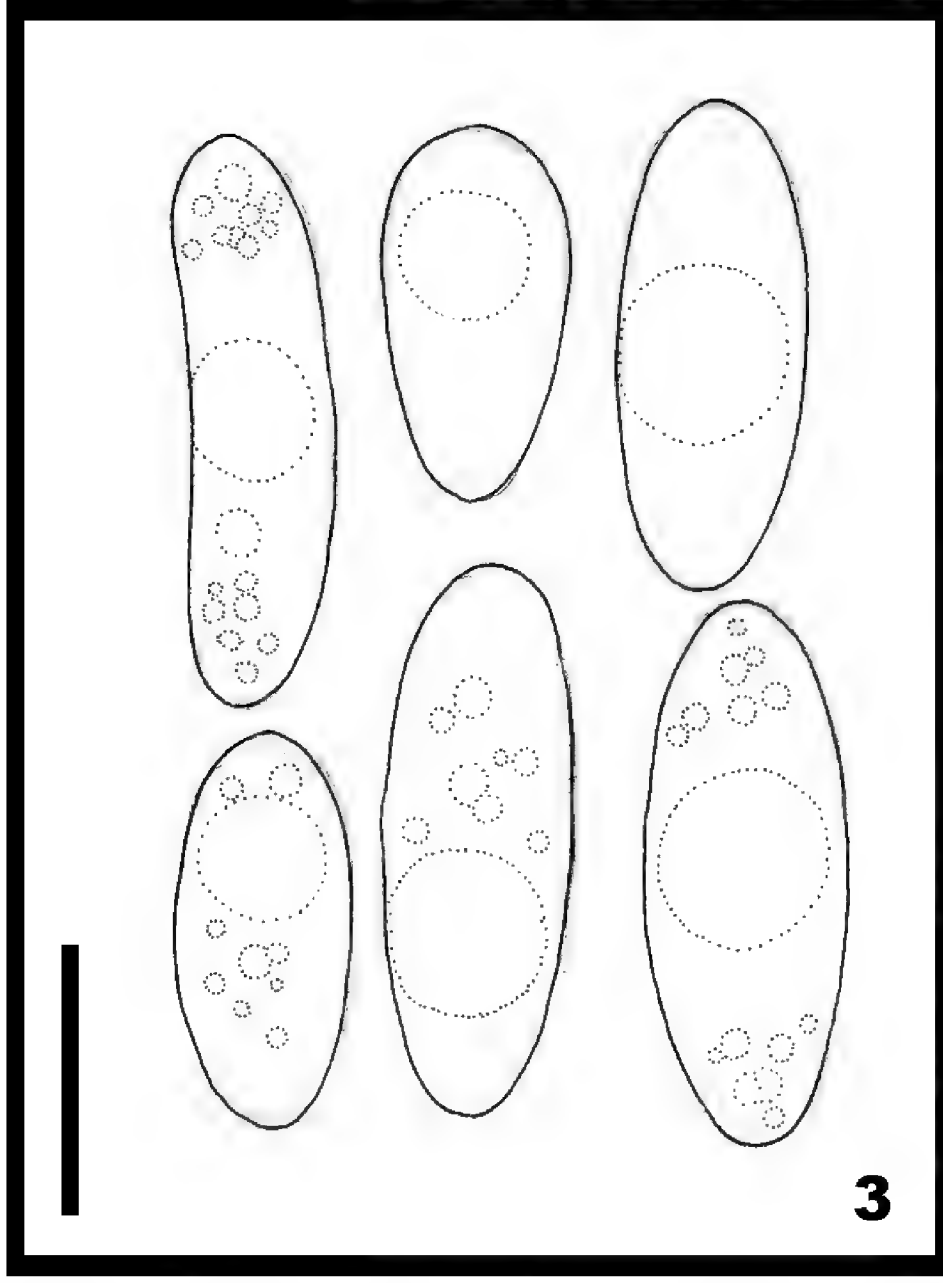
***Sarcogyne algerica* H. Magn.**, Meddel. Göteborgs Bot. Trädgård, 12: 102. 1928. TYPE: ALGERIA: CONSTANTINE: Azeba, on sandstone (on cement walls, rare on limestone), *C. Flagey s.n.* = *Lichenes Algerienses 131* (UPS, **lectotype designated here**).

Sarcogyne algerica is to our knowledge presently only known from the specimens from North Africa, Flagey's *Lichenes Algerienses 131* (UPS), and a specimen in the herbarium of Bouly de Lesdain from Tunisia that was no doubt lost in World War II (Magnusson 1935). The Algerian specimen of Flagey's exsiccate at UPS is here selected as the lectotype. The label of the lectotype states the ascospores are "4–6 x 2–2.5" µm. This range differs significantly from that observed by Magnusson (1935) and us. It is thus possible that the material distributed as *Lichenes Algerienses 131* is heterogenous and the ascospores of specimens in other herbaria should be measured to confirm they do not represent *S. regularis*.

[1]KERRY KNUDSEN– The Herbarium, Department of Botany and Plant Sciences, University of California, Riverside, CA 92521-0124, U.S.A. – e-mail: kk999@msn.com
[2]JAVIER ETAYO – Navarro Villoslada 16, 3°dcha, E-31003, Pamplona, Spain. – e-mail: jetayosa@pnte.cfnavarra.es







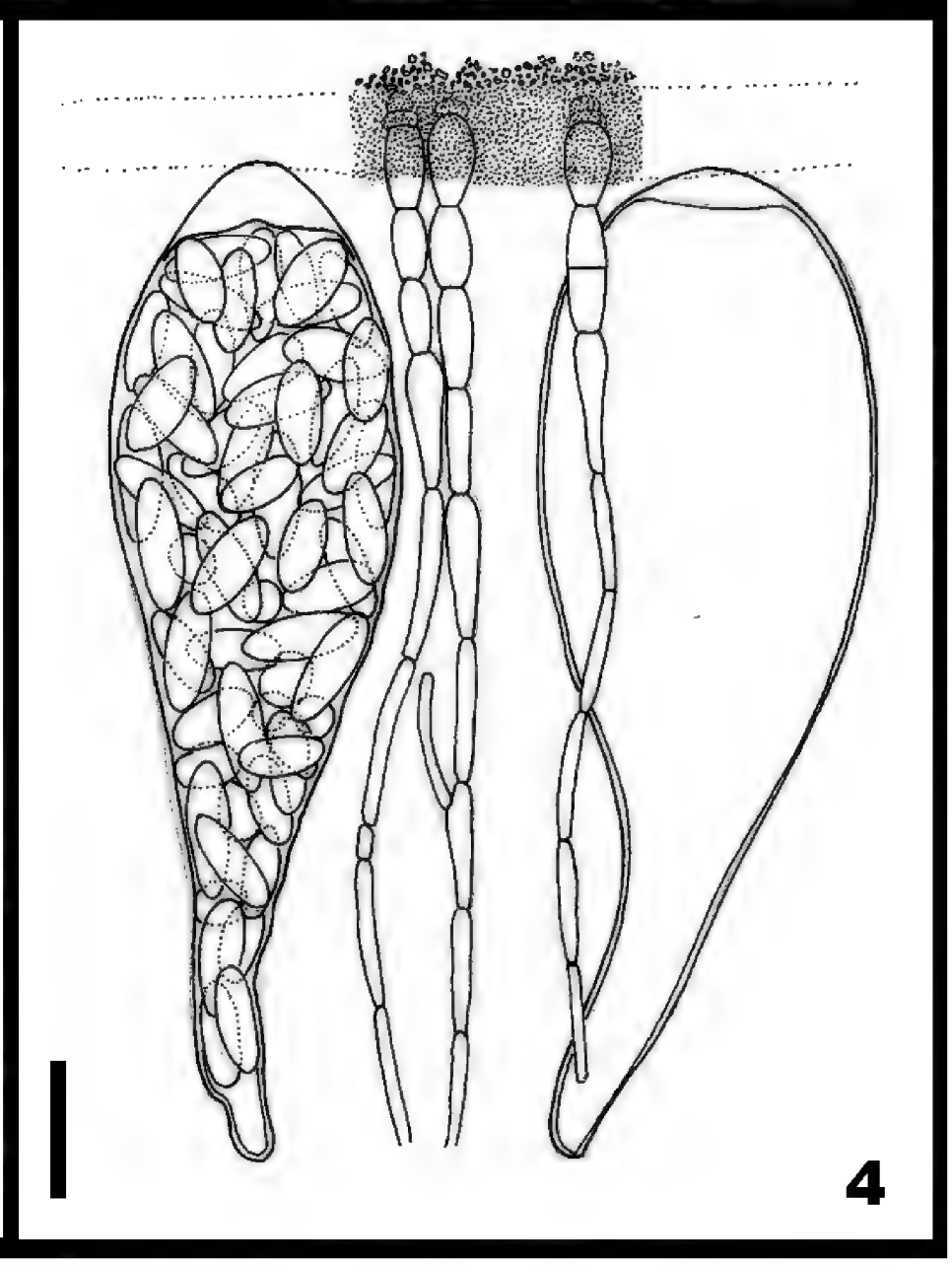


Plate 1. *Sarcogyne algerica*. Figure 1, transverse section of an apothecium showing the subparaplechtenchymatic exciple, outer colored with crystals clusters below (scale = 100 µm). Figure 2, ascospores of *S. regularis* (scale = 5 µm). Figure 3, ascospores of *S. algerica* (scale = 5 µm). Figure 4, asci and paraphyses (scale = 10 µm).

Sarcogyne algerica looks similar to many specimens of *S. regularis*, but has a thin, ecorticate, epilithic thallus of gelatinized hyphae with scattered algae covering the substrate between dispersed apothecia that can easily be mistaken for the substrate itself. The black apothecia are large, mostly 0.7−1.5(−2) mm in diameter, lightly pruinose with a bluish hue, with a prominent margin 0.1−0.15 mm thick. The hymenium is 85−130 µm tall, very conglutinate, with septate paraphyses 2−2.5 µm in diameter, apically thickened to 3−4 µm. The asci are mostly 60−90 x 17−33 µm, with about fifty ascospores per ascus. The ascospore are (5−)7−10(−11.5) x 3−3.5(−4) µm, with the majority of mature ascospores around 7 x 3 µm. The ascospore size, the large apothecia, and the thin thallus are diagnostic.

The species is intermediate between two that produce similar thin ecorticate thalli, *Sarcogyne arenosa* (Herre) K. Knudsen & Standley and *S. magnispora* K. Knudsen & Halici. *Sarcogyne arenosa* has ascospores mostly 4−5 x 2 µm, always has an epruinose disc, and occurs on calcareous and decaying silicate substrates in North America at least from California (where it is common) to Texas and Kansas (Knudsen & Standley 2007; Lendemer et al *in press*). *Sarcogyne magnispora* is currently only known from the type locality in Turkey on limestone and has ascospores mostly 10 x 6 µm (Knudsen et al. 2009).

We report *Sarcogyne algerica* new to Spain and Europe, from some Mediterranean localities in the southern Pyrenees, in Huesca, Zaragoza (Aragón) and Navarra, where it prefers calcareous sandstone rocks from stones embedded in soil to subvertical walls. Species associated with *S. algerica* are *Acarospora cervina* A. Massal., *Diploschistes ocellatus* (Vill.) Norman, *Toninia tumidula* (Sm.) Zahlbr. and *Verrucaria cinereorufa* E.A. Schaer. One of the specimens of *S. algerica* was reported as *S.* aff. *regularis* in Zozaya and Etayo (1994).

SPAIN: HUESCA: Garganta de Jánovas, between Broto and Boltaña, on subvertical sandstone, 28.viii.1991, *J. Etayo s.n.* (hb. Etayo). NAVARRA: way from Murillo to Ujué, on calcareous sandstone in *Pinus* wood, 600 m, 6.viii.1990, *C. Zozaya s.n.* (hb. Etayo 10943); Ujué, cemetery, on the wall, 800 m, 18.ix.1990, *A. Zozaya & C. Zozaya s.n.* (hb. Etayo 10944); Las Bardenas, Arguedas, near cabezo de Castildetirra in Las Cortina reservoir, on sandstones, 21.iii.1993, *J. Etayo 11756* (hb. Etayo). ZARAGOZA: Sierra de Peña, puerto de Sos camino Sos a Sádaba, 1º12'N 42º 29'W, 850 m, 26.ii.1998, *J. Etayo 15480* (hb. Etayo).

Acknowledgements

We thank our reviewers, M. Giralt and M.G. Halici. Anders Nordin (UPS) is thanked for supplying us with the type of *Sarcogyne algerica.*

Literature Cited

Jørgensen, P.M. and R. Santesson. 1993. Nine proposals to conserve generic names of lichenized fungi. Taxon, 42(4): 881-887

Knudsen, K., M.G. Halici and M. Kocakaya. 2009. *Sarcogyne magnispora* (Acarosporaceae), a new species in the nivea group from Turkey. Mycotaxon, 107: 413-417.

Knudsen, K. and S.M. Standley. 2007. *Sarcogyne. In:* T. H. Nash, III, C. Gries and F. Bungartz: Lichen Flora of the Greater Sonoran Desert Region. Volume 3. Lichens Unlimited, Arizona State University, Tempe, pp. 289-296.

Lendemer, J.C., J. Kocourková and K. Knudsen. 2009. Studies in lichens and lichenicolous fungi: more notes on some taxa from North America. Mycotaxon, 108: 491-497.

Lendemer, J.C., J. Kocourková and K. Knudsen, *in press.* Studies in lichens and lichenicolous fungi: more notes on taxa from North America. Mycotaxon.

Magnusson, A.H. 1935. On the species of *Biatorella* and *Sarcogyne* in America. Annales de Cryptogamie Exotique, 7: 115-145.

Reeb, V., F. Lutzoni and C. Roux. 2004. Contribution of RPB2 to multilocus phylogenetic studies of the euascomycetes (Pezizomycotina, Fungi) with special emphasis on the lichen-forming Acarosporaceae and evolution of polyspory. Molecular Phylogenetics and Evolution, 32: 1036-1060.

Zozaya, C. and J. Etayo. 1994(1995). Liquenes saxícolas y hongos liquenícolas de la Sierra de Ujué (Navarra). Studia Botanica, 13: 263-266.

Opuscula Philolichenum, **7**: 65-70. 2009.

Changes in Macrolichens of Douglas County, Wisconsin

James P. Bennett[1] & Clifford M. Wetmore[2]

ABSTRACT. – Macrolichens collected in Douglas County, Wisconsin in the 1940s, 1970s and 2009 are compared in order to determine floristic changes. Species sensitive to disturbance, land use change, and possibly climate that have changed over these time spans are identified and suggested for further monitoring. The total lichen flora of Douglas County is compared with Harris' 1977 publication of the lichens of the Straits of Mackinac.

It is not often that data are available to compare lichen inventories over long periods of time. After exploring the Brule River area of Douglas County, Wisconsin in 2009 (Fig. 1), we were able to put together the data for the macrolichen specimens for the same area collected in the 1940s and the 1970s for comparison with 2009. Hundreds of specimens were collected in this area by J. W. Thomson in the 1940s and by R. Jacobsen and others in the 1970s, allowing such an analysis (Fig. 2). Adjustments for nomenclatural changes were done by standardizing all names to current nomenclature (Esslinger 2008). The results of this analysis are presented here to document a series of floristic benchmarks against which upcoming studies can be compared and changes in the lichen biota can be recognized. It should be mentioned that sampling intensity and quality probably varied across these collectors and are probably factors affecting the results discussed below. The goals of these earlier studies are unfortunately not known.

Established in 1907, the Brule River State Forest constitutes a portion of Douglas County, and is not comparable to any other ecological area in the state of Wisconsin (Wisconsin Natural Heritage Inventory Program 1999). The 50,000 acre (20,234 ha) area contains the entire 44-mile-long (71 km) river basin, which is protected from anthropogenic inputs and has no dams. About half of the basin contains miles of coniferous bogs, which are ideal for lichens (Wisconsin Conservation Department 1954). The earliest known collections from Douglas County, and presumably from the Brule River basin are dated 1907. Other notable natural areas in Douglas County include Amnicon Falls State Park and Pattison State Park. The latter contains the highest waterfalls in Wisconsin and covers almost 1500 acres. The county also contains 18 State Natural Areas totaling almost 16,000 acres (6475 ha), although a few of these are inside the Brule River State Forest. Some of these are over 2000 acres (809 ha). There are lichen records from some of these in several herbaria. For a county of 838,760 acres (339,434 ha), roughly 67,000 (27,114 ha), or 8%, are protected.

Due to the historical collection bias against crustose lichens our analysis was limited to the macrolichen species (Appendix 1). Of these, 99 species were found in the 1940s, while only 59 were found in the 1970s, a decrease of 40%. Of those that were found in the 1940s, 56 were not found in the 1970s. Conversely,of those found in the 1970s, 16 were not found in the 1940s. In other words, only 43 macrolichen species were found at both times, 30 years apart. This is 37% of the total combined number of species of 115, which implies that 63% of the species were unique to the year they were collected. Species sensitive to disturbance or occurring rarely from the 1940s that were not found 30 years later include *Ahtiana aurescens, Bryoria trichodes,* several *Cladonia* species, *Collema conglomeratum, Leptogium arsenei*, *L. cyanescens, Nephroma parile, Pannaria conoplea*, *P. rubiginosa, Parmotrema crinitum*, several *Peltigera* species, several *Phaeophyscia* species, *Platismatia tuckermanii, Ramalina sinensis*, *R. unifolia, Sticta beauvoisii, Usnea cavernosa*, *U. subfusca, Vulpicida pinastri*, and *Xanthomendoza ulophyllodes*. Sensitive species found in the 1970s that were not found in the 1940s include *Anaptychia setifera, Cetraria orbata, Collema furfuraceum, Leptogium austroamericanum, Myelochroa aurulenta,* several *Usnea* and *Xanthoparmelia* species, and *Xanthoria polycarpa.* Successful attempts to locate these species in the future would be very valuable to elucidate possible factors responsible for such changes, including climate change, habitat loss, or anthropogenic effects.

[1]James P. Bennett– USGS & University of Wisconsin, 445 Henry Mall, Madison, WI 53706, U.S.A. – e-mail: jpbennet@wisc.edu

[2]Clifford M. Wetmore – Department of Plant Biology, University of Minnesota, 1445 Gortner Ave., St. Paul, MN 55108, U.S.A. – e-mail: wetmore@umn.edu

Figure 1. Map of Wisconsin with Douglas County in gray.

In 2009, however, 111 macrolichen species were found in the Brule River region of the county, and 46 of these were not found in the 1940s. (A comparison with the 1970s would be more dramatic, but misleading due to the smaller number of species in the 1970s.) This represents a modest 12% increase in species in approximately 70 years. Factors that could explain this are obviously the greater sampling intensity (Fig. 2), nomenclatural changes, splitting of taxa, misidentifications (it was not possible to examine the approximately 500 specimens in WIS), and/or increased habitat diversity due to anthropogenic influences. The total number of macrolichen species since the 1940s is 152. For the 34 species that were not found in 2009, *Ahtiana aurescens, Leptogium arsenei, Pannaria conoplea*, *P. rubiginosa, Ramalina sinensis*, *R. unifolia, Sticta beauvoisii, Usnea subfusca,* and *Xanthoparmelia ulophyllodes* were still not found, as in the 1970s, suggesting these may have been extirpated. The other species found in the 1940s but not in the 1970s were found in 2009. Of the species found in 2009 that were not found earlier, the most interesting find is *Usnea diplotypus*, which is a new species record for Wisconsin.

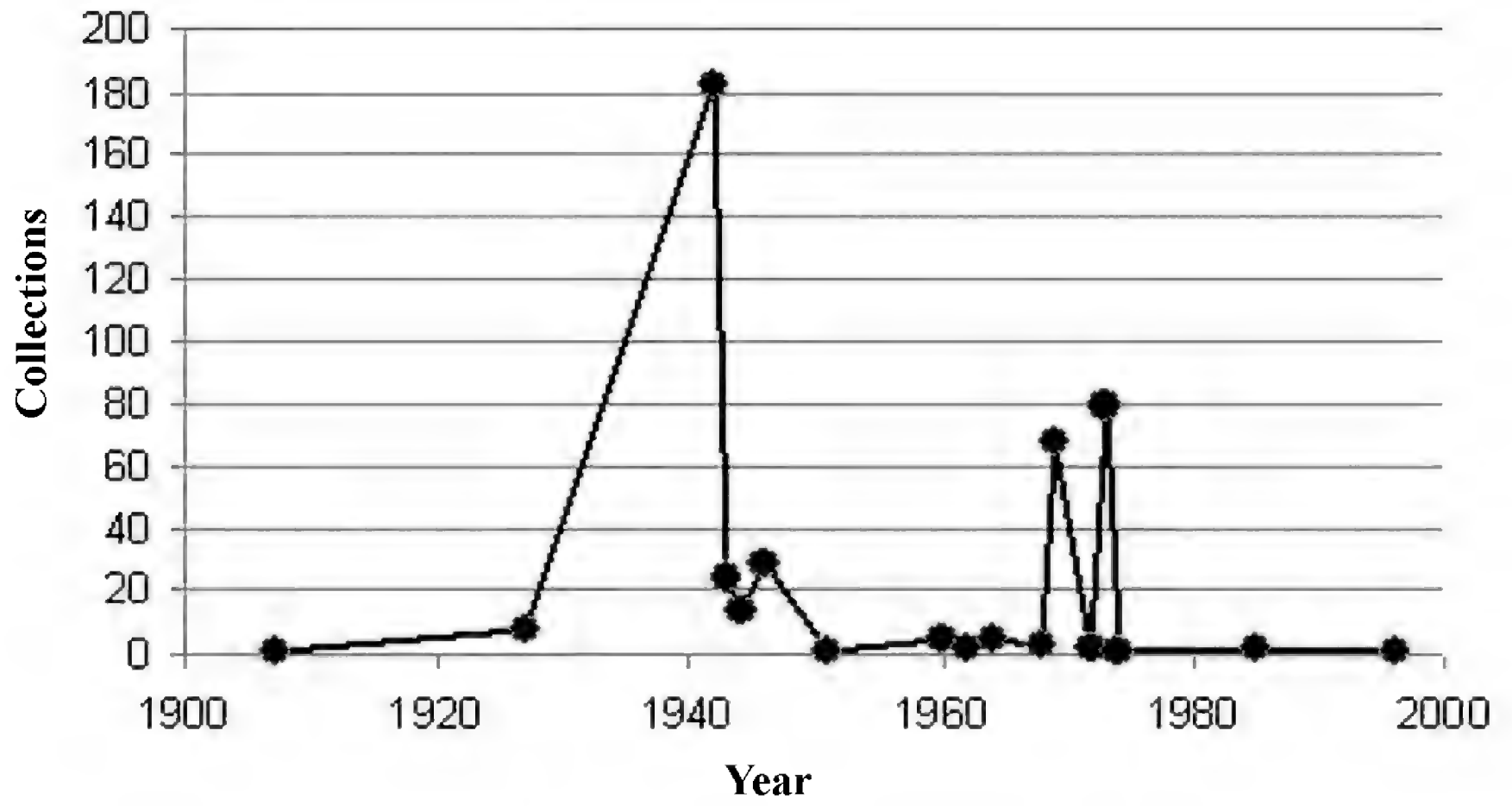


Figure 2. Macrolichen collections by year for Douglas County, Wisconsin. In 2009, 1049 collections were made, which, if added to this figure, would distort the y axis scale.

In 2004, a very small specimen of *Usnea longissima* was discovered in the Brule River area, after long being suspected of being extinct in the state. Unfortunately, attempts to relocate it at the same locality in 2009 were unsuccessful. Harris (1977) listed this species in his 1977 keys, noting it had not been found in the Straits counties, but was present in the western Upper Peninsula of Michigan. The status of this species in the upper Great Lakes region is complex and is in need of a detailed study.

We have tabulated at least 659 collections of lichens in WIS from Douglas County, but these are only the macrolichen species. If we assume a ratio of 1:1 for macro:micro lichens, this would suggest there may be at least 1318+ collections in WIS for this county since 1900. It has been shown for Wisconsin that species numbers per county are directly proportional to specimen numbers (Bennett 2006), so obtaining the specimen numbers for the Straits counties would help to estimate the species numbers for those counties.

In 1977 Richard Harris published *Lichens of the Straits Counties, Michigan* treating approximately 430 species for five counties around the Straits of Mackinac, which is approximately 373 miles (600 km) east of the Brule River area on about the same latitude. Approximately 180 of the 430 species that Harris listed for the Straits counties were not found there, but were thought to occur there because they were known from nearby Isle Royale National Park, which has more than 600 species. Some species in the Straits counties list, e.g. all the *Pannaria*s and *Umbilicaria*s, were not found there at all, but are known from Isle Royale. If they have not been found since the 1970s, it suggests that a better estimate of the Straits counties lichen flora is about 250 species, which may be similar to Douglas County, Wisconsin, the subject of this paper. Our current estimate of the total number of species for Douglas County is 214, including both macro and micro lichens, based on the 2009 collections and Thomson's *Lichens of Wisconsin* (2003). Since this is for one county, it does seem reasonable to adjust the estimate for the Straits counties accordingly. The question remains, however, whether the estimates for Douglas County and the Straits counties are reasonable or are in need of revision and further study. Given the possible changes in climate expected in the near future, studies are needed in regions where historical records exist to better estimate and predict changes in biodiversity.

Acknowledgements

We are grateful for very constructive comments on an earlier version of this paper from James Lendemer, Mathew Nelsen and one anonymous reviewer.

Literature Cited

Bennett, J.P. 2006. What do we know about Wisconsin lichens? Evansia, 23: 13-18.

Esslinger, T.L. 2008. A cumulative checklist for the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. North Dakota State University: http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm (First Posted 1 December 1997, Version #14, 8 October 2008), Fargo, North Dakota.

Harris, R.C. 1977. Lichens of the Straits Counties, Michigan. Published by the author, University of Michigan Herbarium. 152 pp.

Thomson, J.W. 2003. Lichens of Wisconsin. Wisconsin State Herbarium, Department of Botany, University of Wisconsin-Madison. 386 pp.

Wisconsin Conservation Department. 1954. The Brule River, Douglas County.

Wisconsin Natural Heritage Inventory Program. 1999. Biotic Inventory and Analysis of the Brule River State Forest. Madison, Wisconsin.

Appendix 1

Table 1. 152 macrolichens found in Douglas County, Wisconsin in the 1940s, 1970s and 2009.

Species	40s	70s	2009	Species	40s	70s	2009
Ahtiana aurescens	■			*Cladonia merochlorophaea*			■
Anaptychia palmulata			■	*Cladonia mitis*	■		■
Anaptychia setifera		■		*Cladonia multiformis*	■	■	■
Bryora furcellata	■	■	■	*Cladonia ochrochlora*			■
Bryoria trichodes	■		■	*Cladonia pezizifomis*	■		
Candelaria concolor	■	■	■	*Cladonia phyllophora*	■		■
Candelaria fibrosa			■	*Cladonia pyxidata*	■		■
Cetrelia chicitae			■	*Cladonia ramulosa*	■		
Cetrelia olivetorum			■	*Cladonia rangiferina*	■	■	■
Cladonia amaurocraea	■			*Cladonia rei*	■		■
Cladonia botrytes			■	*Cladonia scabriuscula*	■		
Cladonia caespiticia			■	*Cladonia squamosa*	■		■
Cladonia cariosa	■			*Cladonia stellaris*	■		
Cladonia cenotea	■		■	*Cladonia stygia*			■
Cladonia chlorophaea	■	■	■	*Cladonia turgida*	■		■
Cladonia coniocraea	■	■	■	*Cladonia uncialis*	■	■	■
Cladonia cornuta	■			*Cladonia verticillata*	■	■	■
Cladonia crispata	■			*Collema conglomeratum*	■		■
Cladonia cristatella	■	■	■	*Collema furfuraceum*		■	
Cladonia cylindrica	■			*Collema subflaccidum*			■
Cladonia cryptochlorophaea	■		■	*Dermatocarpon luridum*	■	■	
Cladonia decorticata			■	*Evernia mesomorpha*	■	■	■
Cladonia deformis	■			*Flavoparmelia caperata*	■	■	■
Cladonia farinacea	■		■	*Flavopunctelia flaventior*	■	■	■
Cladonia fimbriata	■			*Flavopunctelia soredica*		■	■
Cladonia gracilis	■		■	*Fuscopannaria leucophaea*			■
Cladonia grayi		■	■	*Fuscopannaria leucosticta*			■
Cladonia humilis	■			*Heterodermia speciosa*	■	■	■
Cladonia macilenta	■		■	*Hypogymnia physodes*	■	■	■

Species	40s	70s	2009	Species	40s	70s	2009
Hypogymnia tubulosa			■	*Phaeophyscia rubropulchra*	■		■
Hypotrachyna revoluta			■	*Physcia adscendens*	■	■	■
Imshaugia aleurites			■	*Physcia aipolia*	■	■	■
Imshaugia placorodia			■	*Physcia caesia*	■	■	■
Leptogium arsenei	■			*Physcia dubia*	■		
Leptogium austroamericanum		■		*Physcia millegrana*	■		
Leptogium cyanescens	■		■	*Physcia stellaris*	■	■	■
Leptogium dactylinum	■	■		*Physconia detersa*	■	■	■
Leptogium saturninum			■	*Physconia leucoleiptes*			■
Lobaria pulmonaria	■	■	■	*Platismatia tuckermanii*	■		■
Lobaria quercizans	■	■	■	*Punctelia borreri*		■	
Melanelia exasperatula			■	*Punctelia perreticulata*	■	■	■
Melanelia trabeculata			■	*Punctelia rudecta*	■		■
Melanelixia subaurifera	■	■	■	*Pyxine sorediata*	■	■	■
Melanohalea olivacea	■	■		*Ramalina americana*	■	■	■
Melanohalea septentrionalis	■	■	■	*Ramalina dilacerata*			■
Myelochroa aurulenta		■	■	*Ramalina intermedia*	■	■	
Myelochroa galbina	■	■	■	*Ramalina sinensis*	■		
Nephroma helveticum			■	*Ramalina unifolia*	■		
Nephroma parile	■		■	*Stereocaulon paschale*	■		■
Normandina pulchella			■	*Stereocaulon saxatile*	■	■	
Pannaria conoplea	■			*Stereocaulon tomentosum*	■	■	■
Pannaria rubiginosa	■			*Sticta beauvoisii*	■		
Parmelia saxatilis		■	■	*Tuckermannopsis americana*	■	■	■
Parmelia squarrosa	■		■	*Tuckermannopsis orbata*		■	■
Parmelia sulcata	■	■	■	*Umbilicaria deusta*			■
Parmotrema crinitum	■		■	*Umbilicaria muehlenbergii*		■	■
Peltigera aphthosa	■	■		*Umbilicaria vellea*			■
Peltigera canina	■	■	■	*Usnea cavernosa*	■		■
Peltigera didactyla	■		■	*Usnea diplotypus*			■
Peltigera elisabethae			■	*Usnea filipendula*			■
Peltigera evansiana	■	■	■	*Usnea glabrescens*	■		
Peltigera horizontalis	■	■	■	*Usnea hirta*	■		■
Peltigera leucophlebia	■		■	*Usnea lapponica*			■
Peltigera neckeri			■	*Usnea subfloridana*		■	■
Peltigera polydactylon	■	■	■	*Usnea subfusca*	■		
Peltigera praetextata	■		■	*Vulpicida pinastri*	■		■
Peltigera rufescens	■	■	■	*Xanthomendoza fallax*		■	■
Peltigera venosa	■			*Xanthomendoza fulva*			■
Phaeophyscia adiastola	■			*Xanthomendoza hasseana*	■	■	■
Phaeophyscia cernohorskyi			■	*Xanthomendoza ulophyllodes*	■		
Phaeophyscia chloantha			■	*Xanthoparmelia angustiphylla*	■	■	
Phaeophyscia ciliata	■		■	*Xanthoparmelia conspersa*		■	■
Phaeophyscia hispidula			■	*Xanthoparmelia cumberlandia*		■	■
Phaeophyscia imbricata	■		■	*Xanthoparmelia stenophylla*			■
Phaeophyscia orbicularis	■	■	■	*Xanthoparmelia tasmanica*		■	
Phaeophyscia pusilloides	■		■	*Xanthoria polycarpa*		■	
				Total	100	60	112

Opuscula Philolichenum, **7**: 71-78. 2009.

Lichens of Kejimkujik National Park and National Historic Site, Nova Scotia, Canada (Provisional List)

Richard Troy McMullin [1]

ABSTRACT. – Lichens were collected in Kejimkujik National Park and National Historic Site between 2005 and 2007 during the development of a lichen monitoring protocol. Seventy-one species in 48 genera were located during this time. These records are added to all known lichen collections in the park, bringing the total number of lichen species in Kejimkujik to 185 in 82 genera.

Introduction

Kejimkujik National Park and National Historic Site is located in southwestern Nova Scotia within the UNESCO Southwest Nova Biosphere Reserve (UNESCO 2001). The park is divided into two localities, the larger of which is inland (382 km^2, Lat. 44° 25' N, Long. 65° 15' W) approximately 65 km from the Atlantic coast and 55 km from the Bay of Fundy, the smaller portion (22 km^2, Lat. 43° 50' N, Long. 65° 50' W), Kejimkujik Seaside, is on the Atlantic coast approximately 30 km southwest of Liverpool (Fig. 1). The park contains an extensive lake system, a maximum elevation of 190 m and lies within the Acadian Forest Ecozone (Rowe 1972). The inland portion of the park and Kejimkujik Seaside are located within the Western and Atlantic Coastal Ecoregions, respectively (Neily et al. 2003).

From 2005 to 2007 a lichen monitoring protocol was developed in Kejimkujik (McMullin & Ure 2008), during this time a number of lichen collections were completed. Collections were made primarily in sampling plots in forest ecosystems dominated by *Acer rubrum*, *Quercus rubra* and *Pinus strobus*. This is a common forest type in the park occurring on moderately well-drained, fine to medium textured till soils (Gimbarzevsky 1975). Seventy-one species in 48 genera were located in these plots and other mixedwood forest stands throughout the park (Fig. 2). These records bring the total number of lichen species recorded in Kejimkujik to 185 in 82 genera.

In Kejimkujik, previous lichen collections were made by I.M. Brodo in 1972, M. Ella and A.E. Roland in 1978, and by a number of lichenologists that visited the park during the 8th Tuckerman Workshop in 1999. The collection made by Ella and Roland remains, in part, at the park (Roland 1980). These specimens were reviewed, with F. Anderson, and several annotations were made. Additional species were reported by Roland (1980) that are unavailable. These reports are not included in the present species list unless they were identified by staff at the Canada Museum of Nature in Ottawa. Other park collections are housed as follows: I.M. Brodo at the Canadian Museum of Nature (CANL), R.C. Harris and W.R. Buck at the New York Botanical Garden (NY), S. LaGreca at the London Museum of Natural History (BM) and D.G. Flenniken in a personal herbarium in Ohio. The coordinates of these collections are not included in the present list.

Lichen collections have been made near Kejimkujik in ecosystems similar to those in the park (Cameron 2002, McMullin et al. 2008, F. Anderson pers. com., T. Neily pers. com.). These collections contain many species, including common ones, which have not been recorded in the park, but are likely to occur there. Therefore, the present list is provisional; it does not represent an effort to locate all lichen species in Kejimkujik. A systematic investigation for lichens in various habitats within the park will undoubtedly reveal a greater number of species.

[1]Richard Troy McMullin – Botany Division, Centre for Biodiversity Genomics, Department of Integrative Biology, University of Guelph, Guelph, Ontario, N1G 2W1, Canada – email: rmcmulli@uoguelph.ca

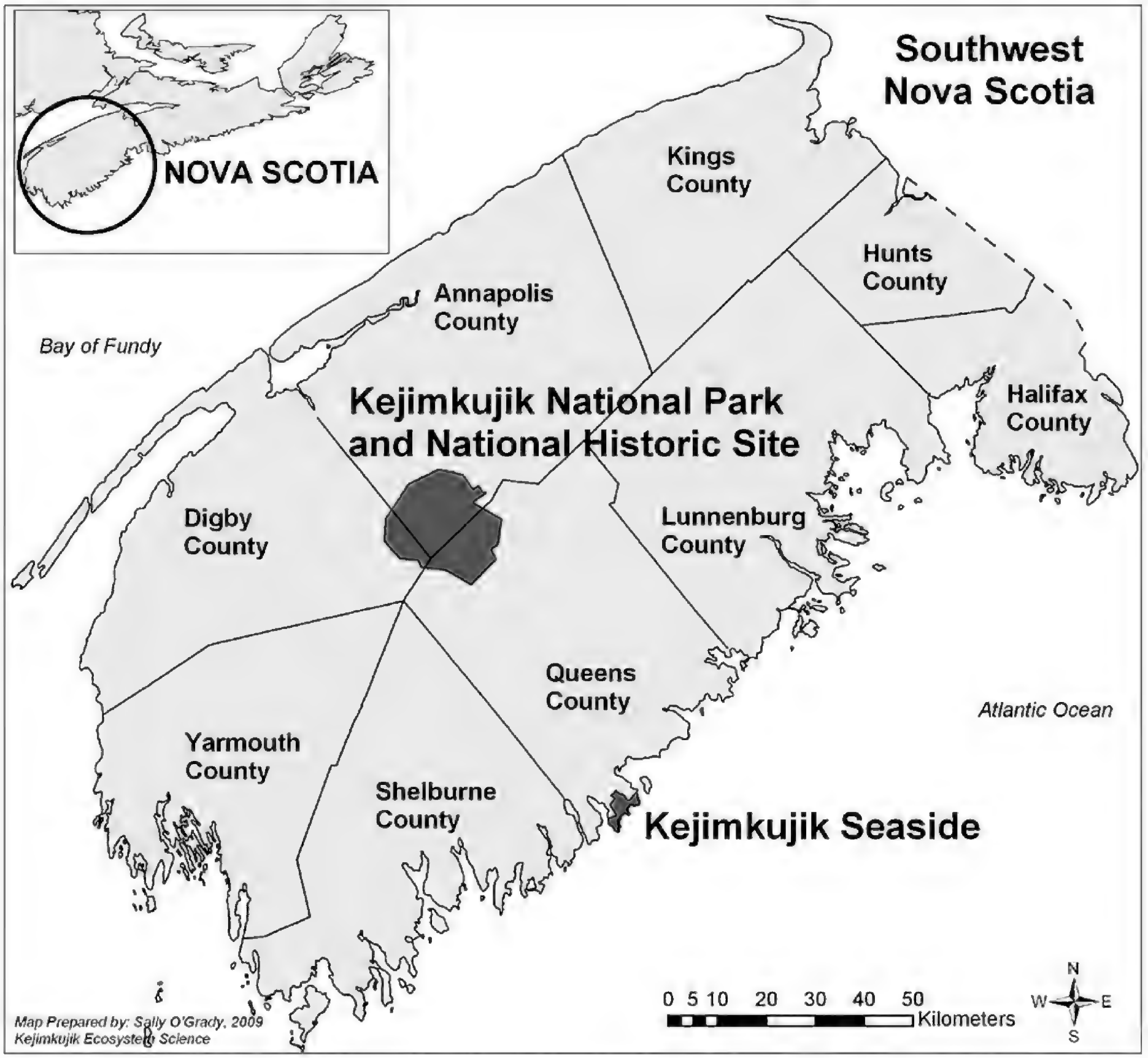


Figure 1. Kejimkujik's inland and coastal localities in Nova Scotia.

Checklist

The checklist below is arranged alphabetically by genus and species. Voucher specimens of the author's collection are stored at Kejimkujik and the Ontario Agricultural College Herbarium at the University of Guelph, Ontario. Roman numerals following the author's collections correspond to the georeferenced localities in Appendix I. Collections followed by an asterisk "*" were only found at Kejimkujik Seaside. Nomenclature follows Brummitt and Powell (1996) and the 15th edition of the North American Lichen Checklist (Esslinger 2009).

Acarospora molybdina (Wahlenb.) Trevisan – *Buck 35821**.
Acarospora sinopica (Wahlenb.) Körb. – *Buck 35834**.
Agonimia sp. Zahlbr. – *Buck 35876*, *35914-A*.
Ahtiana aurescens (Tuck.) Thell & Randlane – *McMullin 2624* (VI).
Anaptychia palmulata (Michx.) Vain. – *Harris 43100*, *McMullin 2625* (IV), *Roland 189*.
Anisomeridium biforme (Borrer) R.C. Harris – *Harris 43084*, *43088*.
Anzia colpodes (Ach.) Stizenb. – *Brodo 18900*, *McMullin 2626* (VI), *Roland 158*.

Arctoparmelia centrifuga (L.) Hale – *Brodo 18945*, *Flenniken 4491.*
Arthonia caesia (Flot.) Körb. – *Harris 43111-B.*
Arthonia patellulata Nyl. – *Harris 43111-B.*
Aspicilia cinerea (L.) Körb. – *Roland 167.*
Aspicilia laevata (Ach.) Arnold – *Buck 35916.*
Bacidia circumspecta (Nyl. ex Vain.) Malme – *Buck 35890*, *Harris 43111-A.*
Bacidia schweinitzii (Fr. ex E. Michener) A. Schneider – *Brodo 18908*, *Buck 35871*, *McMullin 3378* (IV).
Biatora longispora (Degel.) Lendemer & Printzen – *Buck 35912*, *Harris 43108.*
Biatora pontica Printzen & Tønsberg – *Harris 43098*, *43117.*
Biatora pycnidiata Printzen & Tønsberg – *McMullin 2627* (II).
Biatora toensbergii Holien & Printzen – *Buck 35901*, *Harris 43110*, *43108.*
Biatora vernalis (L.) Fr. – *Buck 35904*, *35911*, *35913*, *35921.*
Bryoria furcellata (Fr.) Brodo & D. Hawksw. – *Brodo 18930*, *Flenniken 4492*, *McMullin 2628* (I), *3376* (XIV), *Roland 368.*
Bryoria trichodes (Michx.) Brodo & D. Hawksw. ssp. *trichodes* – *Brodo 18939*, *McMullin 3377* (I), *Roland 421.*
Buellia stillingiana J. Steiner – *Roland 186.*
Calicium glaucellum Ach. – *Brodo 18913*, *Buck 35887.*
Caloplaca xanthostigmoidea (Räsänen) Zahlbr. – *Harris 43090*, *43114.*
Candellariella vitellina (Hoffm.) Müll. Arg. – *Buck 35835*.*
Cetrelia chicitae (W.L. Culb.) W.L. Culb. & C.L. Culb. – *Flenniken 4504*, *Roland 306.*
Cetrelia olivetorum (Nyl.) W.L. Culb. & C.L. Culb. – *McMullin 2630* (V).
Chaenotheca brunneola (Ach.) Müll. Arg. – *Buck 35867*.*
Chaenotheca laevigata Nádv. – *Buck 35880.*
Cladonia amaurocraea (Flörke) Schaer. – *Flenniken 4496.*
Cladonia arbuscula (Wallr.) Flotow – *Brodo 18923*, *Flenniken 4494*, *McMullin 3371* (IX), *Roland 121.*
Cladonia caespiticia (Pers.) Flörke – *McMullin 3368* (XII), *Roland 135.*
Cladonia cenotea (Ach.) Schaer. – *Flenniken 4497*, *Roland 375.*
Cladonia cervicornis subsp. *verticillata* (Hoffm.) Ahti – *Roland 411.*
Cladonia chlorophaea (Flörke ex Sommerf.) Sprengel – *Brodo 18907*, *Roland 134.*
Cladonia coniocraea (Flörke) Spreng. – *Flenniken 4498*, *Roland 371.*
Cladonia cornuta (L.) Hoffm. – *Roland 431.*
Cladonia crispata (Ach.) Flotow – *Roland 336.*
Cladonia cristatella Tuck. – *McMullin 2279* (XIII), *Roland 334.*
Cladonia floerkeana (Fr.) Flörke – *Roland 126.*
Cladonia furcata (Huds.) Schrad. – *Flenniken 4499*, *McMullin 3365* (XII), *Roland 338.*
Cladonia gracilis subsp. *turbinata* (Ach.) Ahti – *Roland 336.*
Cladonia grayi G. Merr. ex Sandst. – *Roland 142.*
Cladonia incrassata Flörke – *Roland 143.*
Cladonia macilenta var. *bacillaris* (Genth) Schaer. – *Roland 370.*
Cladonia maxima (Asahina) Ahti – *Rollins 361.*
Cladonia mitis Sandst. – *Rollins s.n.*
Cladonia ochrochlora Flörke – *McMullin 2631* (IV), *3366*, *Roland 371* (XII).
Cladonia pleurota (Flörke) Schaer. – *Flenniken 4501*, *Roland 358.*
Cladonia pyxidata (L.) Hoffm. – *McMullin 3369* (XII).
Cladonia rangiferina (L.) F.H. Wigg. – *Brodo 18922*, *Roland 269.*
Cladonia scabriuscula (Delise) Nyl. – *Roland 373.*
Cladonia squamosa Hoffm. – *Brodo 18885*, *Flenniken 4502*, *4503*, *Roland 263.*
Cladonia subulata (L.) F.H. Wigg. – *Roland 377.*
Cladonia sulphurina (Michx.) Fr. – *McMullin 3364* (XII).
Cladonia stellaris (Opiz) Pouzar & Vězda – *Roland 122.*
Cladonia terrae-novae Ahti – *Brodo 18915.*
Cladonia uncialis (L.) F.H. Wigg. – *Roland 362.*
Coenogonium luteum (Dicks.) Kalb & Lücking – *Buck 35896*, *McMullin 2634* (V).
Collema subflaccidum Degel. – *Brodo 18910*, *McMullin 2632* (III), *3359* (XII).
Conotrema urceolatum (Ach.) Tuck. – *Brodo 18891*, *McMullin 2633* (XI).
Dibaeis baeomyces (L. f.) Rambold & Hertel – *McMullin 3380* (XIII), *Roland 410.*

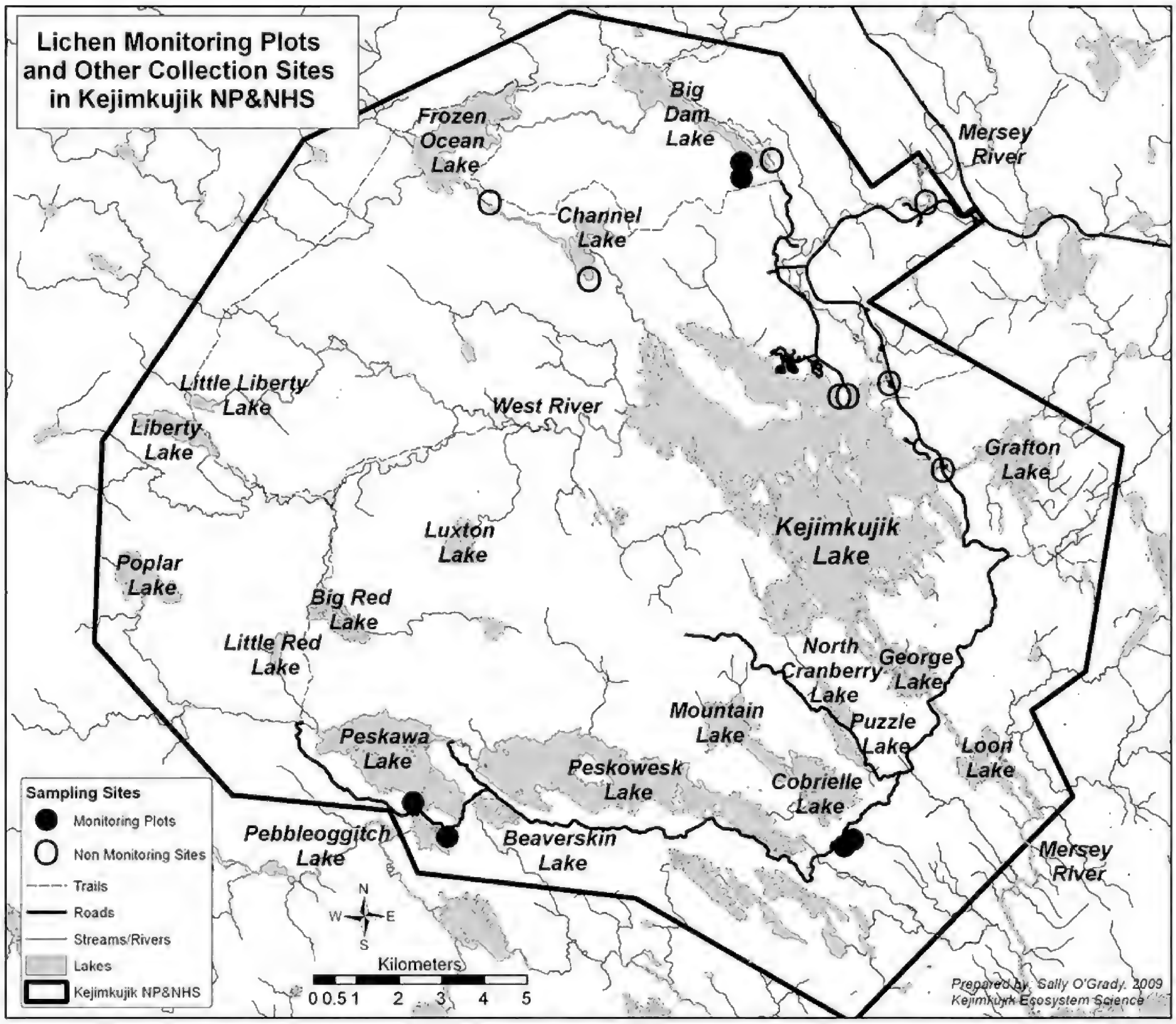


Figure 2. Location of lichen collection sites in Kejimkujik National Park and National Historic Site.

Evernia mesomorpha Nyl. – *McMullin 2635* (VII), *Roland 416.*
Flavoparmelia caperata (L.) Hale – *McMullin 2636* (VIII), *Roland 407.*
Fuscidea recensa (Stirt.) Hertel, V. Wirth & Vězda – *Buck 35818*.*
Graphis scripta (L.) Ach. – *Harris 43093*, *McMullin 2637* (V), *Roland 413.*
Hafellia disciformis (Fr.) Marbach & H. Mayrhofer – *Brodo 18918*, *Harris 43095.*
Hypogymnia incurvoides Rass. – *Roland 423.*
Hypogymnia physodes (L.) Nyl. – *Brodo 18925*, *Flenniken 4505*, *McMullin 2638* (I).
Hypogymnia tubulosa (Schaer.) Hav. – *Brodo 18917*, *McMullin 2639* (VI).
Icmadophila ericetorum (L.) Zahlbr. – *Roland 132.*
Imshaugia placorodia (Ach.) S.L.F. Meyer – *McMullin 2640* (VI).
Lasallia papulosa (Ach.) Llano – *Brodo 18940*, *McMullin 3373* (X), *Roland 91.*
Lecanora argentea Oksner & Volkova – *Buck 35829*.*
Lecanora caesiorubella Ach. subsp. *caesiorubella* – *Brodo 18912*, *McMullin 2641*(II).
Lecanora cinereofusca H. Magn. – *Brodo 18906.*
Lecanora dispersa (Pers.) Sommerf. – *Buck 35826*.*
Lecanora glabrata (Ach.) Malme – *Harris 43099*, *Roland 176.*
Lecanora hybocarpa (Tuck.) Brodo – *Brodo 18884*, *Roland 159.*
Lecanora pulicaris (Pers.) Ach. – *Brodo 18916.*

Lecanora strobilina (Spreng.) Kieffer – *Brodo 18929.*
Lecanora subpallens Zahlbr. – *Brodo 18935.*
Lecanora thysanophora Harris – *Harris 43094*, *McMullin 2642* (IV).
Lecanora xylophila Hue – *Buck 35819**, *35839**.
Lecidea auriculata Th. Fr. – *Buck 35816**.
Lecidea berengeriana (A. Massal.) Th. Fr. – *Roland 140.*
Lecidea brunneofusca H. Magn. – *Brodo 18933.*
Lepraria incana (L.) Ach. – *McMullin 3480* (XIV).
Lepraria lobificans Nyl. – *McMullin 3384* (XIV).
Leptogium corticola (Taylor) Tuck. – *Flenniken 4509.*
Leptogium cyanescens (Rabenh.) Körb. – *Brodo 18909*, *Flenniken 4510*, *McMullin 2643* (XI), *3367* (XII).
Leptogium milligranum Sierk – *Buck 35899.*
Lobaria pulmonaria (L.) Hoffm. – *Brodo 18898*, *Flenniken 4506*, *Harris 43092*, *McMullin 3362* (V), *Roland 148.*
Lobaria quercizans Michx. – *Flenniken 4507*, *McMullin 2645* (VI), *3363* (XII), *Roland 178.*
Lobaria scrobiculata (Scop.) DC. – *Brodo 18896*, *Flenniken 4508*, *McMullin 2646* (I), *Roland 118.*
Lopadium disciforme (Flotow) Kullhem – *McMullin 2647* (I).
Lopadium pezizoideum (Ach.) Körb. – *Brodo 18905.*
Loxospora cismonica (Beltr.) Hafellner – *McMullin 2648* (II).
Loxospora ochrophaea (Tuck.) R.C. Harris – *Brodo 18938*, *Buck 35900*, *McMullin 2649* (V).
Megalaria laureri (Hepp ex Th. Fr.) Hafellner – *Harris 43105*, *43125.*
Melanelia panniformis (Nyl.) Essl. – *Brodo 18934.*
Melanelia sorediata (Ach.) Goward & Ahti – *Brodo 18946.*
Melanelixia subaurifera (Nyl.) O. Blanco et al. – *McMullin 2650* (IX).
Melanohalea olivacea (L.) O. Blanco et al. – *Roland s.n.*
Melanohalea septentrionalis (Lynge) O. Blanco et al. – *Buck 35849**.
Micarea bauschiana (Körb.) V. Wirth & Vězda – *Buck 35894.*
Micarea peliocarpa (Anzi) Coppins & R. Sant. – *Brodo 18883*, *Buck 35884*, *Harris 43086*, *43120.*
Multiclavula sp. – *McMullin 3374* (IX).
Mycobilimbia hypnorum (Lib.) Kalb & Hafellner – *Buck 35883*, *35886.*
Mycoporum compositum (A. Massal.) R.C. Harris – *Harris 43109.*
Myelochroa galbina (Ach.) Elix & Hale – *McMullin 2651* (II).
Normandina pulchella (Borrer) Nyl. – *Buck 35891.*
Ochrolechia androgyna (Hoffm.) Arnold – *Roland 169.*
Ochrolechia pseudopallescens Brodo – *Brodo 18936*, *McMullin 2652* (II).
Ochrolechia trochophora (Vain.) Oshio – *McMullin 2653* (III).
Ochrolechia yasudae Vain. – *Harris 43085.*
Opegrapha atra Pers. – *Buck 35875.*
Parmelia saxatilis (L.) Ach. – *McMullin 2654* (V), *Roland 372.*
Parmelia squarrosa Hale – *Brodo 18895*, *Flenniken 4511*, *McMullin 2655* (II), *Roland 185.*
Parmelia sulcata Taylor – *Buck 35841*, *Flenniken 4512*, *McMullin 3381* (II).
Parmeliella triptophylla (Ach.) Müll. Arg. – *Buck 35909*, *35914-B*, *McMullin 3382* (II).
Peltigera aphthosa (L.) Willd. – *McMullin 2656* (II), *Roland 353.*
Peltigera elisabethae Gyeln. – *Roland 182.*
Peltigera evansiana Gyeln. – *Roland 22.*
Peltigera horizontalis (Hudson) Baumg. – *Roland 365.*
Peltigera polydactylon (Neck.) Hoffm. – *Flenniken 4513.*
Peltigera praetextata (Flörke ex Sommerf.) Zopf – *Flenniken 4514.*
Peltigera rufescens (Weiss) Humb. – *McMullin 3360* (XII).
Pertusaria amara (Ach.) Nyl. – *Buck 35882*, *35828*, *35842*, *Harris 43101*, *McMullin 2657* (V), *Roland 133.*
Pertusaria globularis (Ach.) Tuck. – *McMullin 2658* (III).
Pertusaria macounii (I.M. Lamb) Dibben – *Buck 35906*, *35910*, *Harris 43106*, *43122*, *McMullin 2659* (V).
Pertusaria multipunctoides Dibben – *Brodo 18903.*
Pertusaria rubefacta Erichsen – *Harris 43097.*
Pertusaria velata (Turner) Nyl. – *Buck 35905*, *Harris 43087*, *43107*, *Roland 177.*
Pertusaria waghornei Hulting – *Harris 43087-A.*
Phaeographis inusta (Ach.) Müll. Arg. – *Buck 34847*, *35877.*

Phaeophyscia rubropulchra (Degel.) Essl. – *McMullin 3385* (X), *Roland 162.*
Physcia tenella subsp. *marina* (A. Nyl.) D. Hawksw. – *Buck 35823.*
Physconia detersa (Nyl.) Poelt – *McMullin 2660* (XI).
Platismatia glauca (L.) W.L.Culb. & C.L.Culb. – *Flenniken 4515*, *McMullin 2661* (I), *Roland 331.*
Platismatia tuckermanii (Oakes) W.L.Culb. & C.L.Culb. – *Brodo 18927*, *Flenniken 4516*, *McMullin 2662* (I), *Roland 418.*
Polysporina simplex (Davies) Vězda – *Brodo 18947.*
Porpidia albocaerulescens (Wulfen) Hertel & Knoph – *Brodo 18901*, *Harris 43119*, *McMullin 3370* (XII).
Porpidia crustulata (Ach.) Hertel & Knoph – *Brodo 18894.*
Protoparmelia badia (Hoffm.) Hafellner – *Buck 35845*.*
Pseudocyphellaria perpetua McCune & Miadl. – *McMullin 2663* (I), *Roland 117.*
Punctelia rudecta (Ach.) Krog – *Flenniken 4517*, *McMullin 2664* (V), *Roland 409.*
Pyrenula pseudobufonia (Rehm) R.C. Harris – *Harris 43104*, *McMullin 2665* (IV).
Pyrrhospora varians (Ach.) R.C. Harris – *Brodo 18942.*
Pyxine sorediata (Ach.) Mont. – *Brodo 18902*, *Harris 43116*, *McMullin 2666* (II), *3375*, *Roland 190.*
Ramalina americana Hale – *Buck 35915*, *McMullin 2667* (VIII), *Roland 422.*
Ramalina dilacerata (Hoffm.) Hoffm. – *McMullin 2668* (XI).
Ramalina farinacea (L.) Ach. – *Buck 35832*.*
Ramalina roesleri (Hochst. ex Schaer.) Hue – *McMullin 3383* (VI).
Rhizocarpon geminatum Körb. – *Buck 35836*.*
Rhizocarpon geographicum (L.) DC. – *Buck 35846.*
Rhizocarpon rubescens Th. Fr. – *Brodo 18904.*
Rinodina ascociscana Tuck. – *Harris 43091*, *McMullin 2669* (IV).
Rinodina subminuta H. Magn. – *Harris 43111-D*, *43125-A.*
Ropalospora chlorantha (Tuck.) S. Ekman – *Brodo 18919*, *Buck 35889*, *Harris 43121*, *McMullin 2670* (V).
Stereocaulon dactylophyllum Flörke – *Brodo 18944*, *Flenniken 4518*, *Roland 125.*
Thelotrema lepadinum (Ach.) Ach. – *McMullin 2671* (VI).
Trapeliopsis viridescens (Schrad.) Coppins & P. James – *Buck 35918.*
Trypethelium virens Tuck. – *Brodo 18893*, *Harris 43113*, *43118*, *McMullin 3361* (XII).
Tuckermanopsis americana (Spreng.) Hale – *Roland 97.*
Tuckermannopsis orbata (Nyl.) M.J. Lai – *McMullin 2672* (XIV), *Roland 128.*
Umbilicaria mammulata (Ach.) Tuck. – *McMullin 3372* (X), *Roland 9.*
Umbilicaria muehlenbergii (Ach.) Tuck. – *Brodo 18931*, *Roland 6.*
Umbilicaria polyrhiza (L.) Fr. – *Buck 25848*.*
Usnea cavernosa Tuck. – *Roland s.n.*
Usnea filipendula Stirt. – *McMullin 2673* (X).
Usnea fragilescens Hav. ex Lynge – *Flenniken 4519.*
Usnea fulvoreagens (Räsänen) Räsänen – *Roland s.n.*
Usnea longissima Ach. – *Roland s.n.*
Usnea mutabilis Stirt. – *Flenniken 4520.*
Usnea strigosa (Ach.) Eaton – *Flenniken 4521*, *Harris 43115*, *McMullin 2674* (X), *Roland 417.*
Usnea subfloridana Stirt. – *Flenniken 4522*, *Harris 43102*, *43123*, *Roland 15.*
Usnea trichodea Ach. – *Brodo 18914*, *Harris 43124*, *McMullin 2675* (II), *Roland 355.*
Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale – *Buck 35820*, *Harris 43089*, *Roland 174.*
Xanthoparmelia cumberlandia (Gyeln.) Hale – *Roland 364.*
Xanthoparmelia mougeotii (Schaer.) Hale – *LaGreca 1460*.*
Xanthoria elegans (Link) Th. Fr. – *Buck 35817.*
Xanthoria parietina (L.) Th. Fr. – *Buck 35825.*
Xylographa opegraphella Nyl. ex Rothr. – *Buck 35833*, *35840*, *35893.*

Acknowledgements

Many thanks to: Irwin Brodo, Richard Harris, William Buck, Don Flenniken, and Scott LaGreca for providing collection records; Stephen Clayden, Frances Anderson, and James Lendemer for assistance with identifications; Darien Ure for field assistance and making this project possible; Robert Cameron, James Hinds and Frances Anderson for helpful reviews of the

manuscript; Jonathan Sheppard for providing access to park collections; Sally O'Grady for assisting with park details and the maps; and Sarah Chisholm for helping with field work throughout this project.

Literature Cited

Brummitt, R.K. and C.E. Powell (eds.). 1996. Authors of Plant Names. Royal Botanical Gardens, Kew, Great Britain. 732 pp.

Cameron, R.P. 2002. Habitat associations of epiphytic lichens in managed and unmanaged forest stands in Nova Scotia. Northeastern Naturalist, 9: 27-46.

Esslinger, T.L. 2009. A cumulative checklist for the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. North Dakota State University:http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm (First Posted 1 December 1997, Most Recent Version (#15) 27 August 2009), Fargo, North Dakota.

Gimbarzevsky, P. 1975. Biophysical survey of Kejimkujik National Park. Forest Management Institute Information Report FMR-X-81, Environmental Management Service, Environment Canada. 316 pp.

McMullin, R.T., P.N. Duinker, R.P. Cameron, D.H.S. Richardson, and I.M. Brodo. 2008. Lichens of coniferous old growth forests of southwestern Nova Scotia, Canada, diversity and present status. The Bryologist, 111(4): 620-637.

McMullin, R.T. and D. Ure. 2008. Lichen monitoring protocol for Kejimkujik National Park and National Historic Site of Canada. Report produced for Parks Canada. Maitland Bridge, Nova Scotia. 43 pp.

Neily, P.D., E. Quigley, L. Benjamin, B. Stewart, and T. Duke. 2003. Ecological land classification for Nova Scotia. Nova Scotia Department of Natural Resources, Renewable Resources Branch, Report DNR 2003-2. 83 pp.

Roland, A. 1980. Lichens, liverworts, mosses, and flowering plants of Kejimkujik National Park. Parks Canada Agency. Maitland Bridge, Nova Scotia. 111 pp.

Rowe, J.S. 1972. Forest regions of Canada. Department of the Environment, Canadian Forestry Service. Publ. No. 1300. 172 pp.

UNESCO. 2001. Biosphere Reserve Nomination for Southwest Nova Biosphere. Man and the Biosphere Program, Southwest Nova Biosphere Reserve Association, Nova Scotia 125 pp.

Appendix I – Georeferenced Localities

The roman numerals below correspond to those following the collection numbers of the author included in the checklist above. Data are given as Zone 20T, NAD83.

I:	319774	4923544	- Channel Lake Trail Monitoring Plot A
II:	319774	4923894	- Channel Lake Trail Monitoring Plot B
III:	322386	4907960	- Cobrielle Lake Monitoring Plot A
IV:	322186	4907810	- Cobrielle Lake Monitoring Plot B
V:	312091	4908829	- Peskawa Lake Monitoring Plot A
VI:	312891	4908029	- Peskawa Lake Monitoring Plot B
VII:	313890	4922955	- Along Portage U, between Frozen Ocean Lake and Channel Lake
VIII:	316210	4921150	- Backcountry Camp Site # 9, at the south end of Channel Lake
IX:	322263	4918393	- Jim Charles Campground, site 1
X:	322075	4918388	- Jim Charles Campground, site 2
XI:	324100	4922950	- Visitor Center, forest trail along the river
XII:	324492	4916660	- Grafton Lake, forested area along the river, near the bridge
XIII:	323238	4918703	- Jakes Landing, road side
XIV:	320495	4923944	- Big Dam Lake, on the trail near the turn off for the Hemlocks and Hardwoods Trail

Opuscula Philolichenum, **7**: 79-100. 2009.

The Wisdom of Fools: new molecular and morphological insights into the North American apodetiate species of *Cladonia*

James C. Lendemer[1] & Brendan P. Hodkinson[2]

ABSTRACT. – The taxonomy of the North American apodetiate and superficially apodetiate species of *Cladonia* with persistent, primarily squamulose thalli (viz., *C. apodocarpa, C. caespiticia,* and *C. petrophila*) is revised using morphological, chemical, and ecological data in combination with molecular phylogenetic analyses of ITS1, 5.8S, and ITS2 sequence data. The results of this approach confirm some established taxonomic concepts in the group and raise doubts about others. The taxon known as *C. apodocarpa* is well supported by likelihood- and parsimony-based molecular phylogenetic inferences as well as morphology, chemistry, and ecology. However, molecular evidence gives an equivocal answer to the question of whether *C. petrophila* is a distinct monophyletic entity or if *C. apodocarpa* is nested within it. In addition, no phylogenetic structure is detected for the chemical races of *C. petrophila* with and without fumarprotocetraric acid, based on the markers used in these analyses. However, *C. petrophila* does remain well supported as a taxon by chemistry (i.e., the presence of sphaerophorin), morphology, and ecology. A morphologically and ecologically distinct new taxon is described as *C. stipitata*. We confirm the distant relationship of these taxa (*C. apodocarpa, C. petrophila,* and *C. stipitata*) to *C. caespiticia*, a species with stipitate or pseudopodetiate (vs. sessile) apothecia. A treatment of the North American apodetiate species of *Cladonia* including distribution maps, cited specimens, and illustrations is presented. A key to the taxa that includes unrelated, frequently sterile species of *Cladonia* found in eastern North America is also provided.

Introduction

Species of the genus *Cladonia* P. Browne are generally characterized by their distinctive fruticose podetia, which often bear terminal apothecia. There is, however, a small group of species currently classified in *Cladonia* sect. *Helopodium* (Ach.) S. Stenroos in which the podetia are extremely reduced or absent and whose thalli consist of conspicuous, persistent, primary squamules (Ahti 2000, Stenroos et al. 2002, Jahns & Beltman 1973). In North America, this group is represented by three described species, *C. apodocarpa* A. Evans, *C. caespiticia* (Pers.) Flörke, and *C. petrophila* R.C. Harris, all of which are restricted to the eastern portion of the continent. Thalli of these species are commonly encountered and frequently sterile, or at least appear so in the field. Thus, it is not surprising that these taxa are perceived as taxonomically difficult and as such often ignored by collectors because their collection and identification is seen as a futile pursuit (Harris 1992). However, as is evidenced by the description of new species by Harris (1992) and Ahti (2000), collection and study of this group is not without reward.

With the above in mind, we have made a distinct effort to collect primarily squamulose thalli of *Cladonia* during our field studies in eastern North America in hopes of finding a sufficient way of dealing with these problematic lichens and potentially uncovering additional, overlooked taxa. As specimens accumulated, we became aware of several entities from the Appalachian Mountains whose taxonomic status and relationships were obscured by their cryptic habit and morphology that is reduced compared to other species of *Cladonia*. Because we could not rely solely on so-called "traditional" characters to fully evaluate these entities, we decided to undertake the present study and utilize molecular data to provide an additional dataset against which we could test our taxonomic

[1]James C. Lendemer – Cryptogamic Herbarium, Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY 10458-5126, U.S.A. – e-mail: jlendemer@nybg.org
[2]Brendan P. Hodkinson – Dept. of Biology, Box 90338, Duke University, Durham, NC 27708, U.S.A. – e-mail: brendan.hodkinson@duke.edu

hypotheses. Toward this end, we generated ITS sequences from a geographically broad sampling of the collections that we had gathered and aligned these with sequences that we generated from an equally broad sampling of *C. apodocarpa* and *C. petrophila*.

The results of our study clearly illustrate the utility of an approach to alpha-taxonomy that involves integrating molecular data with so-called "traditional" characters of biogeography, chemistry, ecology, and morphology. A unified approach such as we have undertaken here often reveals the taxonomic value of characters that have previously been overlooked or underestimated (Amtoft et al. 2008, Argüello et al. 2007, Arup 2006, Hodkinson & Lendemer in rev., Lendemer & Hodkinson in rev.). In the present study ecological characters and vegetative morphology were found to be of unexpected value and, when combined with molecular data, led us to recognize four apodetiate species of *Cladonia* in eastern North America: *C. apodocarpa, C. caespiticia, C. petrophila*, and the newly described *C. stipitata* Lendemer & Hodkinson.

Materials & Methods

Fieldwork and herbarium materials. – Since learning of the existence of *Cladonia petrophila*, we have made a special effort to observe and collect primarily squamulose *Cladonia* thalli and their associated ecological data in conjunction with our fieldwork. The result of this effort has been the accumulation of hundreds of freshly-collected herbarium specimens from throughout eastern North America that represent an unbiased sample of the apodetiate *Cladonia* species that occur in the region. These specimens served as the primary resource for this study and have been deposited in the herbarium of The New York Botanical Garden (NY). Due to the unassuming nature of these taxa and the assumption that they are often sterile and thus unidentifiable, they are often poorly represented in herbaria. As such, we limited this study to our own collections and the holdings of undetermined sterile *Cladonia* specimens, *C. apodocarpa, C. caespiticia,* and *C. petrophila* at DUKE and NY.

Molecular methods. – DNA extractions were performed at NY using the DNeasy Plant Mini Kit (Qiagen, Valencia, CA, USA) with the instructions modified to include a prolonged (~12 hour) incubation period in the lysis buffer. Isolated DNA was resuspended in 100 µl of sterile water and stored at -20°C. PCR amplification was performed at NY using the primers ITS4 and ITS5 (White et al. 1990). Amplification reactions of 25 µl contained each of the following: 2.5 µl 10X PCR Buffer (Qiagen), 2.5 µl dNTP solution (mixed to a concentration of 2 mM of each dNTP), 2.5 µl BSA solution (mixed to a concentration of 2.5 mg μl^{-1} of bovine serum albumin; Hillis et al. 1996), 0.2 µl Taq DNA Polymerase (= 1 U; Qiagen), 1 µl of each primer (in solution at a concentration of 10 µM), 9.3 µl of sterile water, 1 µl of extracted DNA, and 5 µl of Q-solution (Qiagen). PCR protocol followed Nelsen et al. (2007) and consisted of an initial denaturation of 95°C for 5 min, followed by 10 cycles of 95°C for 1 min, 62°C for 1 min, and 72°C for 1 min, then 35 cycles of 95°C for 1 min, 53°C for 1 min and 72°C for 1 min with a final extension for 7 minutes at 72°C. PCR products were visualized prior to sequencing by UV examination of a 1% agarose gel on which 1 µl of amplified PCR product had been subjected to electrophoresis and stained with ethidium bromide. Unpurified amplified PCR products were sent to the University of Washington Biochemistry DNA Sequencing Facility (BDSF) for sequencing. Sequences were assembled and manually edited using the software package Sequencher™ 4.9 (Gene Codes Corporation, Ann Arbor, MI, USA). In order to identify contaminants, nearest sequence matches were found by searching the nucleotide collection in GenBank using BLASTn (Altschul et al. 1997).

Taxon Sampling. – The goal of the present study was to resolve the placement of several groups of apodetiate *Cladonia* populations from eastern North America that we considered to potentially represent distinct taxonomic entities. We conducted analyses of a dataset consisting of sequences from the nuclear ribosomal ITS region (ITS1, 5.8S, and ITS2). In addition to sequences (n=12) that we generated from populations of the putative taxa, we generated additional sequences from populations representing typical *C. apodocarpa* (n=5), *C. caespiticia* (n=1), and *C. petrophila* (n=7) to supplement those available in GenBank (one sequence for each of the aforementioned taxa). For outgroups, we used selected sequences from Stenroos et al. (2002) that (1) represented taxa for which more than one sequence of the full ITS region was available and (2) could be reasonably aligned with those from the members of section *Helopodium* that we studied without the need to exclude/recode large amounts of the analyzed nucleotide alignment (see "*Sequence Alignment*" and "*Phylogenetic Analyses*" sections below, and note that similar criteria are outlined by Hodkinson & Lendemer (in rev.) and Lendemer & Hodkinson (in rev.)).

Sequence Alignment. – Sequences were initially aligned using ClustalX 2.0 (Larkin et al. 2007), and were subsequently adjusted manually in Mesquite 2.6 (Maddison & Maddison 2009) taking into consideration rRNA secondary structure (Kjer 1995) based on models developed by Beiggi and Piercey-Normore (2007) for *Cladonia*

grayi G. Merr. *ex* Sandst. During the process of sequence alignment, it became clear (by comparing our sequences to the reference sequences from section *Helopodium*) that, as part of the editing process, numerous insertions representing sites that were apparently unique to a given species had inadvertently been deleted from the reference sequences. When an insertion was present in all sequences of a particular taxon in section *Helopodium*, except for the reference sequence, the 'gap' symbol ('-') in the reference sequence was replaced by the 'missing' symbol ('?') to offset the effect of this potentially erroneous sequence editing (since 'gap' was treated as a fifth character state in subsequent analyses).

PHYLOGENETIC ANALYSES. – Weighted maximum parsimony (MP) inferences were made using PAUP* 4.0b10 (Swofford 2001). Introns, nucSSU/nucLSU residues, constant sites, and ambiguously-aligned regions were excluded from analyses. Ambiguously aligned regions were re-coded using INAASE 3.0 (Lutzoni et al. 2000), reintegrated as new characters, and subjected to specific step-matrices (as outlined by Hodkinson & Lutzoni (2009)); for a review of logistical details regarding reintegrating characters and implementing step-matrices, see Hodkinson & Lendemer (in rev.)). Unambiguously-aligned portions were subjected to symmetric step matrices computed in STMatrix 3.0 (Miadlikowska et al. 2002; available at http://www.lutzonilab.net/pages/download.shtml) as outlined by Gaya et al. (2003, 2008). For each dataset, a first round of searches was performed with 1000 random-addition-sequence (RAS) replicates and TBR (tree bisection-reconnection) branch swapping. The MULTREES option was in effect and zero-length branches were collapsed. This analysis resulted in the best tree island being hit in 75.2% of the RAS replicates. Branch support was estimated through bootstrap analyses (Felsenstein 1985) by performing 1000 bootstrap replicates with 5 RAS per bootstrap replicate, with all other settings as above. Maximum likelihood (ML) topology and bootstrap searches were performed using RAxML 7.0.4 with GTRMIX and 1000 resamplings (Stamatakis 2006).

CHEMICAL AND MORPHOLOGICAL ANALYSES. – All specimens were studied dry using a Bausch & Lomb StereoZoom 7 dissecting microscope. Macromorphological characters of thallus size, squamule broadness, branching, aspect, and basal color were noted. All specimens were also subjected to chemical analysis using both standard spot tests (reagents abbreviated following Brodo et al. (2001)) and Thin Layer Chromatography (TLC). TLC was carried out using solvent systems A or C following the standardized methods of Culberson & Kristinsson (1970).

RESULTS AND DISCUSSION

I. – GENERAL REMARKS

As has been discussed in the introduction above, the primary goal of the present study was to evaluate the taxonomic status of some unusual apodetiate *Cladonia* populations from the Appalachian Mountains. These populations seemed to be distinct from the three species known to occur in the region (*C. apodocarpa, C. caespiticia,* and *C. petrophila*) and could be grouped into three putative taxonomic entities. These entities have been little discussed in print (e.g., Lendemer & Tripp 2008) and are generally not represented in herbaria because they have either been overlooked or have gone uncollected as a result of their apparent sterility and lack of podetia. We only became aware of them after several years of concentrated fieldwork led us to suspect that more than just *C. apodocarpa*, *C. caespiticia,* and *C. petrophila* were present in the region (although *C. stipitata* had been recognized in NY as a chemotype of *C. petrophila*). In fact, while our study did resolve the status of these putative taxa (see sections IIa-c below), the increased sampling in our molecular dataset also afforded us the opportunity to examine in detail the circumscriptions and relationships of the taxa that had already been described in the group.

The results of our phylogenetic analyses (Plate 1) confirmed the findings of Stenroos et al. (2002) that *Cladonia caespiticia* is distantly related to *C. apodocarpa* and *C. petrophila*, and thus that *Cladonia* sect. *Helopodium* is not monophyletic. This distant relationship is not surprising considering that *C. caespiticia* is morphologically dissimilar to other apodetiate species in both vegetative morphology and in the development of the apothecia (see section IIa below). The robust sampling within *C. apodocarpa* and *C. petrophila* s.l. revealed that the ITS region alone does not seem to be sufficient for resolving relationships within this species complex. In the phylogeny presented by Stenroos et al. (2002) the two species, each represented by a single terminal, were found to be sister to each other. However, increased sampling revealed that, while the sequences of *C. apodocarpa* form a well-supported monophyletic clade, it is not clear whether this clade is nested within *C. petrophila* or if the latter species is itself a monophyletic grouping that simply cannot be defined on the basis of ITS sequence data alone. Considering the equivocal nature of the molecular data, and the fact that *C. apodocarpa* and *C. petrophila* are well characterized by a suite of traditional characters (see taxonomic section below), we prefer to retain them as distinct here pending further study with molecular methods.

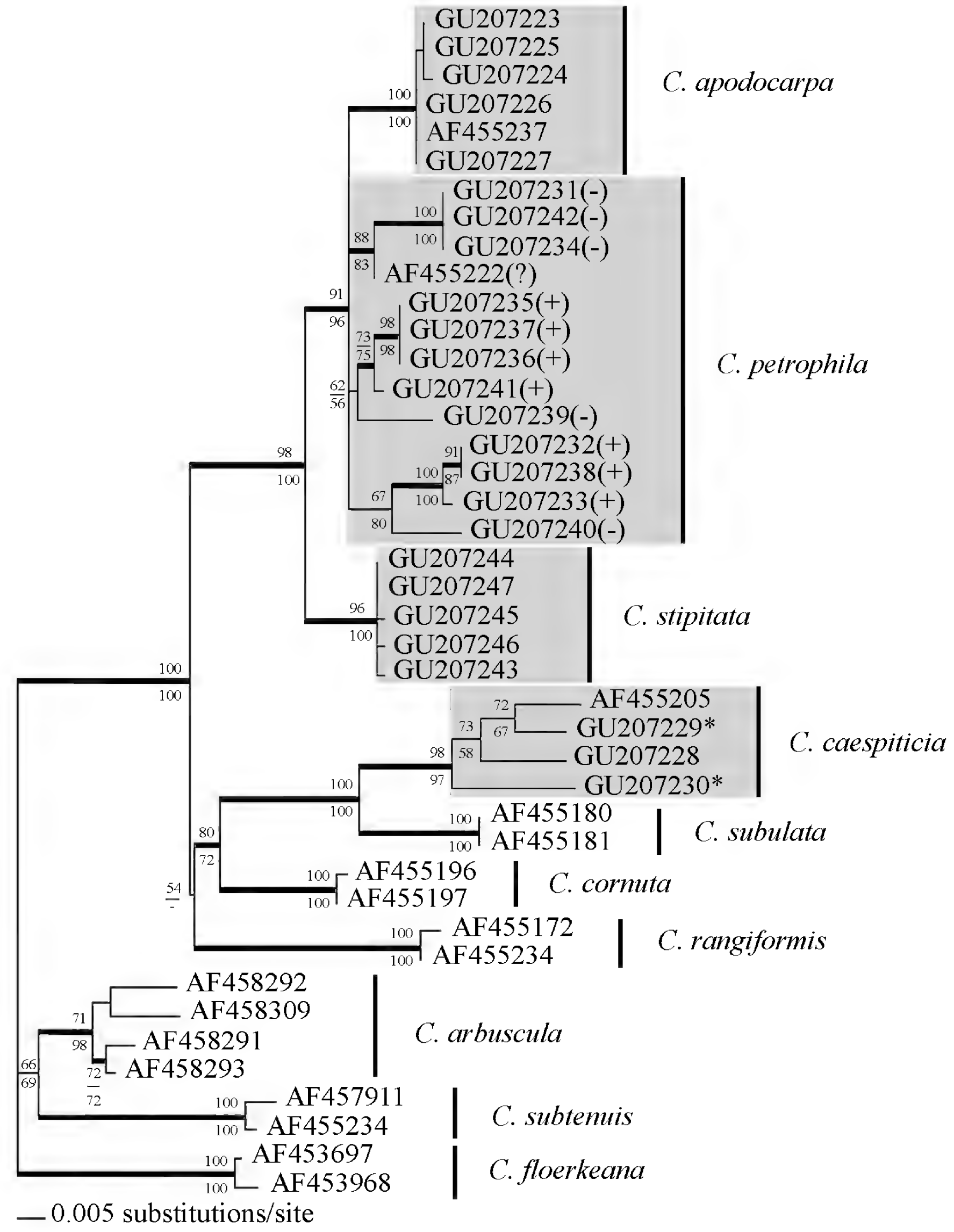


Plate 1. Maximum likelihood (ML) phylogenetic tree showing inferred relationships among selected members of the genus *Cladonia* based on ITS1, 5.8S, and ITS2 sequence data. Support is shown in the form of ML bootstrap proportions (BP) and maximum parsimony (MP) BP, each based on 1000 replicate resamplings. BP values ≥50% are shown above (ML-BP) and below (MP-BP) each internode, with branches supported by both ML-BP and MP-BP ≥70% thickened. Plus "+" and minus "-" symbols following the accession numbers of sequences of *C. petrophila* refer to the presence/absence of fumarprotocetraric acid. Asterisks "*" following sequences in the clade representing *C. caespiticia* indicate vouchers of the first putative taxon. Members of *Cladonia* sect. *Helopodium* are shaded in gray.

II. – Discussion and resolution of the putative taxonomic entites

IIa. – *Cladonia caespiticia* s.l.

The first putative taxon that we examined was seemingly restricted to sandstone boulders in boulder fields and talus slopes in Pennsylvania. Thalli from these populations were consistently sterile but distinctive because of their large primary squamules (often > 1 cm long), otherwise resembling those of *Cladonia caespiticia* in being thin, delicate, and finely incised. While the morphological similarity of these populations to *C. caespiticia* was further correlated to chemistry (i.e., the presence of only fumarprotocetraric acid), their ecology and size were striking enough to warrant further study.

We generated sequences from two populations of this putative taxon and included them in our analysis with a sequence of *Cladonia caespiticia* from GenBank as well as one that we generated from a typical fertile population in southern New Jersey. In the results of our analysis (Plate 1), the sequences derived from the unusual saxicolous populations from Pennsylvania form a well-supported monophyletic group with those of typical *C. caespiticia*. *Cladonia caespiticia* is generally considered to be a terricolous species that can also occur on the bases of trees and on mossy shaded rocks. Our results indicate that the species has a wider ecological amplitude than previously thought. This conclusion was further supported when we examined the holdings of *C. caespiticia* at NY and found several saxicolous collections that were fertile and otherwise morphologically typical in having small squamules.

Interestingly, our results also strongly support the taxonomic value of vegetative morphology in circumscribing this taxon. The aberrant populations that we examined differed from typical *Cladonia caespiticia* only in their larger size and ecology. Our molecular analyses also confirmed the distant relationship of *C. caespiticia* to the rest of the known North American apodetiate taxa. This distant relationship is further supported by differences in the morphology of the apothecia; while the apothecia of *C. apodocarpa, C. petrophila,* and a new member of this group (described below) are sessile on the squamules at maturity, the apothecia of *C. caespiticia* are distinctly elevated because they form a stipe or short ecorticate pseudopodetium (Brodo et al. 2001, fig. 217).

IIb. – *Cladonia petrophila* s.l.

The second putative taxon that we examined was restricted to shaded granitic rocks at low- to middle-elevations in the southern Appalachian Mountains. The populations were sympatric with, and morphologically identical to, *Cladonia petrophila* but differed chemically in the absence of fumarprotocetraric acid. The presence of this chemotype was not mentioned in the protologue of *C. petrophila* (Harris 1992) and it does not appear to have been mentioned otherwise in print. After collecting the chemotype several times during fieldwork in North Carolina we examined the holdings of *C. petrophila* at NY and discovered several additional specimens from other portions of the southern Appalachians.

Because we could not detect any ecological or morphological differences between the two chemotypes, and both were found at the same locality, we decided to use molecular data to investigate whether a previously unrecognized geographically restricted cryptic taxon was involved. We generated five sequences from three populations of the chemotype that lacks fumarprotocetraric acid. We then generated an additional seven sequences of the typical chemotype of *Cladonia petrophila* from seven populations across its geographic range including one from a region where the chemotypes are sympatric. These additional sequences were generated both to increase the robustness of our sampling and to supplement the one sequence available in GenBank (AF455222[3]). Our analyses of these sequences (Plate 1) revealed that the chemotypes do not seem to represent distinct monophyletic groups and thus the hypothesis that the chemotype lacking fumarprotocetraric acid is a distinct taxon is not supported by molecular data from the ITS region. We propose that the circumscription of *C. petrophila* should be expanded to include populations that lack fumarprotocetraric acid.

While conducting background research for this study, we discovered that the chemical phenomenon observed in *Cladonia petrophila* appears to be widespread in the genus *Cladonia.* There are apparently a number of cases in which species that produce major secondary metabolites in addition to fumarprotocetraric are known to have chemotypes in which the latter substance is either present or absent while the primary compound is consistently present (e.g., the two chemotypes of *C. grayi*). The results of our study of *C. petrophila* would seem to support the stance that such chemotypes should not be treated as distinct taxa, even when they appear to be geographically distinct. We do not, however, believe that our results justify any taxonomic changes outside of the current taxon.

---

[3] Unfortunately the chemical content of the voucher upon which AF455222 is neither noted in GenBank nor in print (Stenroos et al. 2002), and we have not reviewed the specimen.

Rather we believe that the status of morphologically identical chemotypes should be evaluated with molecular methods on an individual basis.

IIc. – *Cladonia stipitata*

The final putative taxon that we examined has an interesting history of study (see the proceeding taxonomic section) and is an excellent example of the value of a unified approach to alpha-taxonomy. Several years ago the first author (JCL) first encountered a population of this perplexing entity on an exposed low-elevation granitic bald in North Carolina. Although the thalli in this population were morphologically similar to *Cladonia petrophila*, they were chemically different in lacking sphaerophorin and producing atranorin as a major substance. The chemistry (atranorin and fumarprotocetraric acid) drew comparison to *C. apodocarpa*; however, that taxon has much larger squamules and occurs on soil or humus in disturbed habitats. Lendemer and Tripp (2008) recognized that the problem required further study and thus reported the population as *C. petrophila* s.l., noting the absence of sphaerophorin. During subsequent fieldwork the first author and his colleagues at NY found additional populations of this entity at other granitic balds elsewhere in the southern Appalachians. Study of the undetermined *Cladonia* collections at NY and DUKE also revealed the existence of several additional collections from the region (most of which had been recognized as a chemotype of *C. petrophila* at NY), as well as from massive granite outcrops in the Piedmont of Georgia, and one from a similar habitat in Rhode Island.

Confronted with what seemed to be an ecologically and geographically distinct entity (with a unique morphology that could have been induced by its distinctive ecology), we generated five sequences from three populations. In our analyses (Plate 1), these sequences emerged as a well-supported monophyletic group, supporting its status as a taxon distinct from *Cladonia apodocarpa* and *C. petrophila*. We thus describe these populations as a new species, *C. stipitata*, in the following section.

It is noteworthy that the sequences of *Cladonia stipitata* possess a ubiquitous (n=5) ~210 base-pair group I intron. The presence of this intron was confirmed both by gel electrophoresis and sequencing. The latter method revealed that the intron is actually found in the small portion of the nucSSU rDNA that is amplified by the ITS primers used in this study. Interestingly, the intron was entirely absent in the sequences of *C. apodocarpa* (n=5) and *C. petrophila* (n=12) examined. In *C. caespiticia* it was present in two of the three sequences that we generated. The situation found in *C. caespiticia* is apparently typical in *Cladonia* (Myllys et al. 2003); however, the ubiquity of this intron in one phylogenetic species (i.e., *C. stipitata*) and its complete absence in a closely related clade (i.e., *C. apodocarpa/petrophila*) suggests that there may be forces selecting for the presence and/or absence of introns in this group of species. It has been shown previously that introns can improve transcriptional and translational yield in fungi (Juneau et al. 2006), which can be especially beneficial under stressful conditions (Parenteau et al. 2008). The trend seen here may be correlated with the fact that *C. stipitata* lives in an environment that is more barren and receives more ultraviolet radiation than the environments inhabited by *C. apodocarpa* and *C. petrophila*; however, further study is required before any conclusions of this nature can be drawn.

III. – Taxonomic Section

IIIa – Key to the frequently-sterile *Cladonia* species of eastern North America*

1. Squamules C+ green (strepsilin present).....*C. strepsilis* (Ach.) Grognot
1. Squamules C- (strepsilin absent).....2

2. Squamules extremely large (10-20 mm long) and branching; P+ red, K+ yellow (fumarprotocetraric acid and atranorin present); SE coastal plain.....*C. prostrata* A. Evans
2. Squamules mostly smaller (<10 mm long) and not branching; chemistry various; distribution various.....3

3. On calcareous substrates; squamules thick and appressed to the substrate, appearing foliose; podetia cupped when present; northern.....*C. pocillum* (Ach.) Grognot
3. On non-calcareous substrates; squamules not as above, usually ascending; podetia rare or unknown.....4

4. Squamules yellowish-green, KC+ golden (usnic acid and barbatic acid present)...*C. robbinsii* A. Evans
4. Squamules gray or blue-gray, KC- (usnic acid and barbatic acid absent; atranorin present or absent) 5

5. Medulla UV+ blue-white (sphaerophorin present), P± red (fumarprotocetraric acid present or absent); typical of rock outcrops in shaded forests……*C. petrophila* R.C. Harris
5. Medulla UV- (sphaerophorin absent), P+ red (fumarprotocetraric acid always present); typical of other habitats……..……...6

6. Squamules K+ yellow (atranorin present)……7

7. Squamules long and erect, upper portions convex-reflexed to show the white underside, without a blackened narrow stipe; thallus not forming distinct cushions; typical of roadside banks and disturbed areas; widespread……..*C. apodocarpa* Robbins
7. Squamules shorter and not distinctly erect, upper portions concave ± obscuring the underside, with a distinct blackened narrowed stipe; thallus forming low dense cushions or mats; typical of granitic outcrops in sunny openings; generally known from the central-southern Appalachians and Piedmont…*C. stipitata* Lendemer & Hodkinson

6. Squamules K- (atranorin absent)…….....8

8. Squamules large and broad, margins not finely divided; podetia rare, when present forming tall irregular cup-like structures……..……*C. mateocyatha* Robbins
8. Squamules smaller, narrow, margins finely divided; podetia absent; apothecia when present borne on a stipe/ecorticate pseudopodetium.....……*C. caespiticia* (Pers.) Flörke

*This key does not include a number of species that normally produce podetia but can also be found sterile. The excluded species fall into two main groups: 1) species with sorediate squamules or squamules that break down into granules or micro-squamules, and 2) members of the *Cladonia subcariosa* group with squamules that are generally short and not easily confused with the squamules of species in this key. Additionally, the most frequently sterile members of the *C. subcariosa* group have distinctive ecologies (they tend to occur on soil and sand in disturbed areas) and chemistries (e.g., *C. brevis* (Sandst.) Sandst. contains psoromic acid, *C. polycarpia* G. Merr. contains stictic acid, and *C. polycarpoides* Nyl. contains norstictic acid). *Cladonia sobolescens* Nyl. *ex* Vain., a member of the *C. subcariosa* group with fumarprotocetraric acid, is rarely sterile; however, sterile specimens of this species would be almost impossible to determine in light of the numerous other species with small squamules and similar chemistries.

IIIB. – The Species

Although we recognize that the group of taxa treated here is artificial, we believe that a treatment of the four species is useful in light of their superficial similarities. It is also useful because when Harris (1992) described *Cladonia petrophila* he drew comparisons to *C. apodocarpa* and *C. caespiticia*. Because the aforementioned species have been well illustrated and described in recent publications (Ahti 2000, Brodo et al. 2001, Harris 1992, Hinds & Hinds 2007), we present abbreviated treatments for these taxa below and describe only the new species *C. stipitata* in detail.

1. ***Cladonia apodocarpa*** **Robbins**, Rhodora, 27: 211. 1926. TYPE: U.S.A., Massachussetts, Plymouth Co., Wareham, 1924, *C.A. Robbins s.n.* (FH, lectotype n.v.[selected by Ahti (1993)]).

Plate 2 (Page 87).

Descriptions. – Ahti (2000: 237), Thomson (1967: 87).

Published color illustration. – Brodo et al. (2001: 238 [fig. 210]).

Chemistry. – Atranorin (major), fumarprotocetraric acid (major). Spot tests: K+ yellow, C-, KC-, P+ red, UV-.

Ecology. – This species typically occurs on soil and humus in recently disturbed habitats or other areas such as forest openings where succession is arrested because of natural factors such as periodic fire. It typically occurs in edge habitats where it is not fully exposed to the sun but rather protected by shade, at least periodically. Although we have not observed saxicolous populations of *Cladonia apodocarpa*, several specimens we examined listed the ecology as "vertical rock faces" or "boulders in light shade". Thalli in these specimens appeared to represent typical *C. apodocarpa* and almost certainly occurred on a layer of soil or humus rather than directly on rock.

DISTRIBUTION. – *Cladonia apodocarpa* is known primarily from eastern North America, where it is common and widespread at low to middle elevations. Although the species is most common south of the boreal region, records from as far north as Quebec have been reported (Thomson 1967). Ahti (2000) also reported the species from a single locality in Uruguay and noted a questionable literature report by Thomson (1967) from Haiti.

DISCUSSION. – Due to the large size of its squamules, *Cladonia apodocarpa* is not easily confused with any of its close relatives, namely *C. petrophila* and *C. stipitata*. Rather, it is likely to be confused with sterile thalli of members of the *C. subcariosa* group, with which it frequently occurs. Members of the *C. subcariosa* group that occur in eastern North America differ chemically from *C. apodocarpa* in lacking the combination of atranorin and fumarprotocetraric acid. The primary squamules of taxa in the *C. subcariosa* group also tend to be coarser, less fragile, and shorter than those of *C. apodocarpa* although these characters are variable and distinguishing among species in the field (i.e., without access to chemical data) can be difficult. In most cases, however, careful examination of a given, apparently sterile population will reveal the presence of some podetia. Several species of *Cladonia* with cushion-forming primary squamules that could be confused with *C. apodocarpa*, particularly *C. robbinsii* and *C. strepsilis*, are distinguished in the above key.

Although the apothecia of *Cladonia apodocarpa* have generally been described as being sessile on the primary squamules of the thallus (Brodo et al. 2001, Evans 1930, Hinds & Hinds 2007, Robbins 1925, Thomson 1967), they were recently noted to be borne on short podetia by Ahti (2000). Unfortunately, we cannot confirm either interpretation because mature apothecia were not present on any of the specimens that we examined.

SELECTED SPECIMENS EXAMINED. - **U.S.A. ALABAMA.** CLAY CO.: Talladega National Forest, Cheaha Wilderness, 24.i.1992, *R.C. Harris 28367* (NY**). JACKSON CO.:** Pisgah, 2.x.1999, *R.C. Harris 43354* (NY). **ARKANSAS.** BAXTER CO.: Ozark National Forest, Leatherwood Wilderness, 18.iv.2005, *R.C. Harris 51178* (NY). FRANKLIN CO.: Ozark National Forest, Spy Rock Hollow, 8.vi.2002, *W.R. Buck 37245* (NY). GARLAND CO.: Hot Springs National Park, 22.v.2001, *C.M. Wetmore 26025* (NY). IZARD CO.: NE corner of Devil's Knob-Devil's Backbone Natural Area, 24.x.2001, *R.C. Harris 45372* (NY). JEFFERSON CO.: Pine Bluff Arsenal, 1.xii.1999, *D. Ladd 21818 & M. Pederson* (NY). MADISON CO.: Madison County Wildlife Management Area, 2.xi.2000, *R.C. Harris 44674* (NY). NEWTON CO.: Ozark National Forest, Boston Mountains, 24.iv.1988, *R.C. Harris 21486* (NY). POPE CO.: Ozark National Forest, Kings Bluff, 7.xi.2002, *R.C. Harris 46874* (NY). SEARCY CO.: Buffalo National River, N of Woolum Campground, 17.iv.2005, *R.C. Harris 51020* (NY). SHARP CO.: Strawberry River Preserve, 25.x.2001, *R.C. Harris 45477* (NY). STONE CO.: Ozark National Forest, Gunner Pool Recreation Area, 25.iv.1988, *R.C. Harris 21594* (NY). **DELAWARE.** KENT CO.: Milford Crossroads, 6.xi.1886, *A. Commons 102* (NY). NEW CASTLE CO.: Wilmington, 3.i.1890, *A. Commons s.n.* (NY). SUSSEX CO.: Rt. 113 near Ellendale, xi.1936, *R.H. Torrey s.n.* (NY). **DISTRICT OF COLUMBIA.:** Takoma Park, 15.xi.1896, *T.A. Williams 8* (NY). **GEORGIA.** DADE CO.: Sitton's Gulf, W side of Lookout Mt., 17.iii.1939, *R. McVaugh 4731* (NY). DAWSON CO.: Amicalola Falls State Park, 25.xi.2000, *W.R. Buck 38878* (NY). STEPHENS CO.: Chattahoochee National Forest, ~2 km above Toccoa Falls, 21.ix.1992, *R.C. Harris 28000* (NY). TOWNS CO.: Southern Nantahala Wilderness, Hightower Gap to Rich Knob, 11.xi.2007, *J.C. Lendemer et al. 10948* (NY). WALKER CO.: Chattahoochee National Forest, Keown Falls, 23.ix.1992, *R.C. Harris 28277* (NY). **ILLINOIS.** COLES CO.: Fox Ridge State Park, 19.ix.1986, *T. Motley 32* (NY). POPE CO.: Shawnee National Forest, Hayes Creek, 16.x.1993, *R.C. Harris 31405* (NY). UNION CO.: Berryville Shale Glade Nature Preserve, 6.xi.2004, *R.C. Harris 50518* (NY). **INDIANA.** HARRISON CO.: 2.5 mi N of Leavenworth, 28.viii.1945, *C.C. Deam 63646* (NY). **KENTUCKY.** BULLITT CO.: Bernheim Arboretum, 25.iii.2002, *D. Ladd 23331 & M. Ladd* (NY). ELLIOTT CO.: Mauk Ridge, 3.v.1981, *C.F. Reed 112325* (NY). KNOX CO.: Rt. 11, Greenroad, 30.iv.1981, *C.F. Reed 118004* (NY). MARTIN CO.: Wolf Creek, 26.ii.1962, *R.M. Reed 16* (NY). ROWAN CO.: Daniel Boone National Forest, 9.x.1995, *R.C. Harris 36793* (NY). **MARYLAND.** BALTIMORE CO.: Bens Run, 25.ii.1933, *C.C. Plitt 84* (NY). CALVERT CO.: 5 mi N of Solomons Island, 12.x.1962, *C.F. Reed 59078* (NY). CARROLL CO.: 2 mi N of Mt. Airy, 22.iv.1963, *C.F. Reed 61599* (NY). FREDERICK CO.: Sugar Loaf Mt., 19.iv.1962, *C.F. Reed 55765* (NY). GARRETT CO.: 2 mi S of Redhouse, 24.vi.1962, *C.F. Reed 54424* (NY). HARFORD CO.: 2.5 mi S of Dublin, 24.v.1965, *C.F. Reed 69768* (NY). HOWARD CO.: Savage, 17.i.1962, *C.F. Reed 53990* (NY). MONTGOMERY CO.: Plummer's Island, 7.xi.1937, *E.C. Leonard 2710* (NY). PRINCE GEORGES CO.: near Croom, 2.iii.1962, *C.F. Reed 55137* (NY). **MASSACHUSETTS.** BERKSHIRE CO.: Bartholomew's Cobble, 28.iii.1981, *R.C. Harris 13547* (NY). ESSEX CO.: S of Newburyport, 30.v.1973, *C.F. Reed 94215* (NY). FRANKLIN CO.: Town of Rowe, 19.ix.1998, *R.C. Harris 42277* (NY). WORCESTER CO.: Sturbridge, 22.x.1955, *B.N. Gates 112* (NY). **MISSOURI.** BARRY CO.: Mark Twain National Forest, Piney Creek Wilderness, 27.iii.2006, *R.C. Harris 52186* (NY). CARTER CO.: S of Van Buren, 23.ix.1990, *R.C. Harris 25649A* (NY). CHRISTIAN CO.: Mark Twain National Forest, Devreaux Ridge, 21.v.2003, *R.C. Harris 47683* (NY). GASCONADE CO.: Canaan Conservation Area, 25.iii.2006, *R.C. Harris 52026* (NY). IRON CO.: E slope Royal Gorge, 27.iv.1988, *R.C. Harris 21771* (NY). JEFFERSON CO.: Don Robertson Property, 24.iii.2006, *J.C. Lendemer et al. 5989* (NY). LAWRENCE CO.: Fall Hollow Gorge, 27.iii.2006, *R.C. Harris 52144* (NY). MADISON CO.: Mark Twain National Forest, near N end of CR 408/FS 2604, 14.x.2003, *R.C. Harris 48350* (NY). McDONALD CO.: Huckleberry Ridge Conservation Area, 29.x.2000, *R.C. Harris 44211* (NY). MONTGOMERY CO.: Graham Cave State Park, 27.x.2001, *R.C. Harris 45735* (NY). MORGAN CO.: Frank E. Carpenter Memorial Conservation Area, 15.iv.2005, *W.R. Buck 48599* (NY). OZARK CO.: Mark Twain National Forest, Smoke

Plate 2. *Cladonia apodocarpa*. Figure 1, typical habitat (Lackawanna Co., Pennsylvania, USA). Figure 2, thallus (*Harris 24794*, scale = 5 mm). Figure 3, detail of primary squamules (*Harris 24794*, scale = 10 mm).

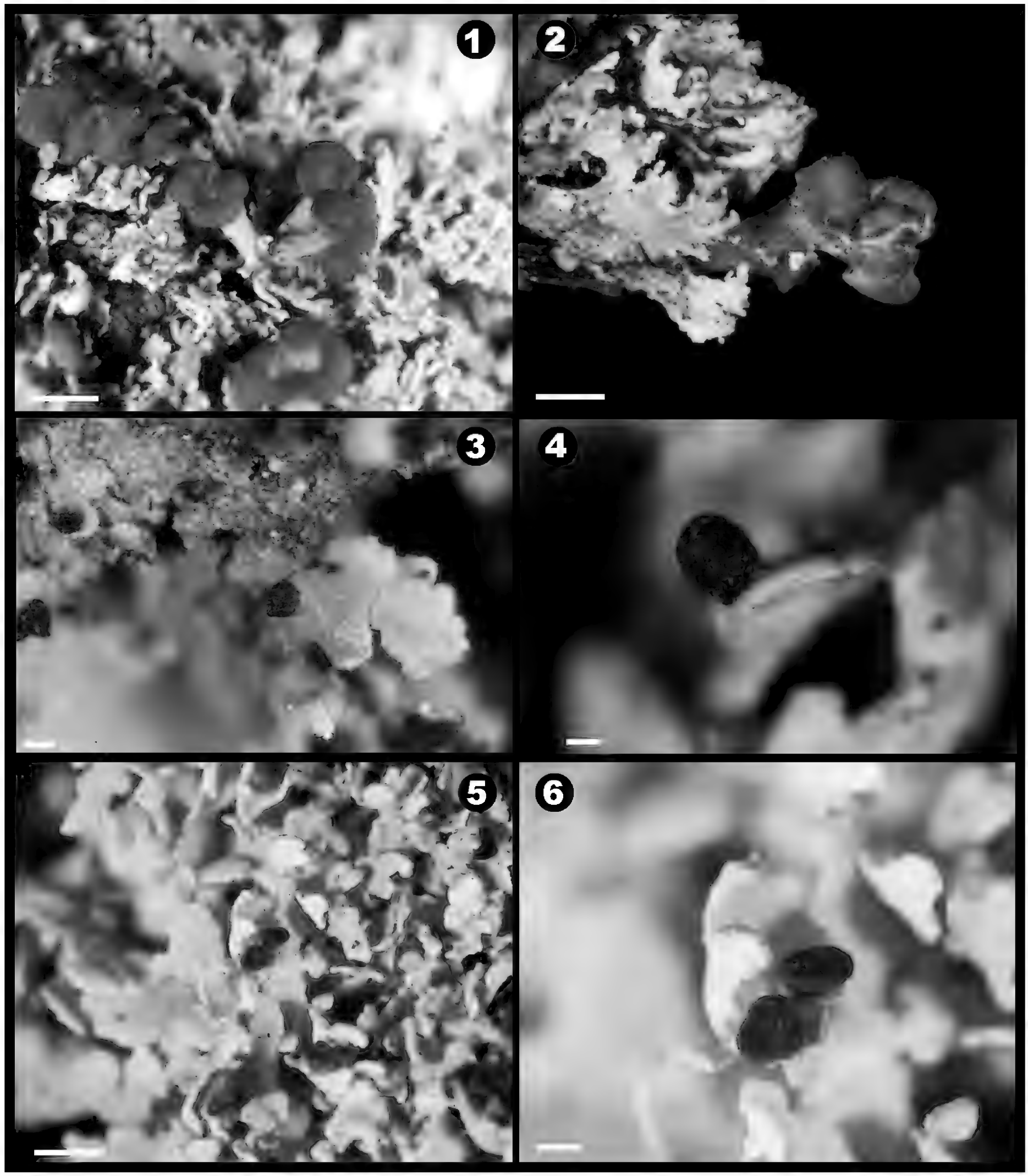


Plate 3. Figure 1, mature apothecia of *Cladonia caespiticia* (*Harris 52734A*; scale = 1 mm). Figure 2, mature apothecia and primary squamules of *C. caespiticia* (*Buck 53753*; scale = 1 mm). Figure 3, pycnidia of *C. caespiticia* (*Harris 52734A*; scale = 0.5 mm). Figure 4, pycnidium of *C. petrophila* (*Harris 10730*; scale = 0.1 mm). Figure 5, mature apothecia and primary squamules of *C. petrophila* (*Harris 10730*; scale = 1 mm). Figure 6, detail of mature apothecia of *C. petrophila* (*Harris 10730*; scale = 0.25 mm).

Tree Scenic Lookout, 18.iv.1997, *R.C. Harris 40630* (NY). PHELPS CO.: Mark Twain National Forest, Bradford Branch, 14.vi. 1995, *D. Ladd 18915* (NY). SHANNON CO.: Angeline Conservation Area, 19.iv.2005, *R.C. Harris 51276* (NY). ST. CLAIR CO.: Buzzard Bluff, 22.iv.1988, *R.C. Harris 21269* (NY). ST. FRANCOIS CO.: W of Knob Lick Fire Tower, 19.ix.1990, *R.C. Harris 25492* (NY). ST. LOUIS CO.: Rockwoods Reservation, 26.x.2001, *R.C. Harris 45663* (NY). TANEY CO.: Mark Twain National Forest, Hercules Glades Wilderness, 22.v.2003, *R.C. Harris 47749* (NY). TEXAS CO.: 16 km SSE of Yukon, 18.x. 1984, *W.L. Culberson 19699* (NY). WRIGHT CO.: John Alva Fuson M.S. Conservation Area, 4.xi.2002, *R.C. Harris 46645* (NY). **NEW JERSEY.** BERGEN CO.: Closter, *C.F. Austin 513* (NY). PASSAIC CO.: Ringwood Mines, 1935, *R.H. Torrey s.n.* (NY). SALEM CO.: Rd. to Jericho, 6.iv.1991, *C.F. Reed 133921* (NY). SUSSEX CO.: Stokes State Forest, 29.iii.2008, *J.C. Lendemer et al. 11561* (NY). **NORTH CAROLINA.** CLAY CO.: Nantahala National Forest, Buck Creek Barren, 10.xi.2007, *J.C. Lendemer et al. 10769* (NY). HENDERSON CO.: Chimney Rock Falls, 14.vi.1981, *C.F. Reed 1981-118* (NY). JACKSON CO.: Nantahala National Forest, Panthertown Valley, 29.iv.2006, *R.C. Harris 52497* (NY). MACON CO.: Nantahala National Forest, McDowell Mountain, 12.viii.1994, *R.C. Harris 33126* (NY). MCDOWELL CO.: 2 mi S of Deer Lick Gap Overlook, 6.v. 1967, *S.B. Pravda s.n.* (NY). MONTGOMERY CO.: Uwharrie National Forest, 19.iv.2008, *G.B. Perlmutter et al. 1391* (NY). SWAIN CO.: Great Smoky Mountain National Park, Hughes Ridge Trail, 16.v.1976, *R.C. Harris 10977* (NY). WAKE CO.: William B. Umstead State Park, 14.i.2007, *J.C. Lendemer et al. 8362* (NY). WILKES CO.: Stone Mountain State Park, 23.ix. 1993, *R.C. Harris 30802* (NY). YANCEY CO.: Newdale, 26.ii.1982, *C.F. Reed 114994* (NY). **OHIO.** GALLIA CO.: Wayne National Forest, Symmes Creek Natural Area, 19.v.2006, *R.C. Harris 52660* (NY). SCIOTO CO.: Shawnee State Forest, at S jct of FS 3 & FS 6, 21.v.2006, *R.C. Harris 52736* (NY). **OKLAHOMA.** CHEROKEE CO.: Cookson Wildlife Management Area, 14.iv.2004, *R.C. Harris 48926* (NY). **PENNSYLVANIA.** BRADFORD CO.: New Albany, 10.x.1987, *J.K. McGrath 511-6* (NY). CHESTER CO.: Street Rd. near West Chester Pike, 12.ii.1966, *C.F. Reed 73076* (NY). DELAWARE CO.: Tyler Arboretum, Pink Hill, 17.vii.2005, *J.C. Lendemer 4491 & A.E. Schuyler* (NY). HUNTINGDON CO.: Trough Creek State Park, 22.iv.2008, *J.C. Lendemer et al. 11803* (NY). LANCASTER CO.: New Texas Serpentine Barrens, 8.iv.2000, *R.C. Harris 43838* (NY). MONROE CO.: Delaware Water Gap, 27.iv.1986, *M.G. Peidl 7037-A* (NY). MONTGOMERY CO.: Fulshaw Craeg Preserve, 9.iv.2004, *J.C. Lendemer 2179 & A.F. Rhoads* (NY). PIKE CO.: Delaware Water Gap National Recreation Area, PEEC, *J.C. Lendemer 5051* (NY). WYOMING CO.: Bowmans Creek Ledges, 20.vii.2008, *J.C. Lendemer 13503* (NY). **YORK CO.:** Big Mount Rd., 18.iv.1988, *C.F. Reed 141194* (NY). **SOUTH CAROLINA.** LANCASTER CO.: Forty Acre Rock Heritage Preserve, 5.x.1999, *R.C. Harris 43479* (NY). LAURENS CO.: N of Gray Court, 20.iv.1982, *C.F. Reed 15768* (NY). OCONEE CO.: Mountain Rest, *C.F. Reed 115651* (NY). PICKENS CO.: Rocky Bottom Church Rd., 27.ix.1989, *R.C. Harris 24794* (NY). **TENNESSEE.** MONROE CO.: Cherokee National Forest, Bald River Falls Quad., 6.viii.1994, *R.C. Harris 32898* (NY). POLK CO.: Cherokee National Forest, Cohutta Wilderness Area, 5.x.1998, *R.C. Harris 42471* (NY). **VIRGINIA.** WILLAMSBURG: College of William & Mary, 2.iv.2004, *B. Hodkinson 1946* (DUKE).

2. *Cladonia caespiticia* (Pers.) Flörke, De Cladon., p. 8. 1827.

Baeomyces caespiticia Pers., Ann. Bot. (Usteri), 7: 155. 1794. TYPE: "The Netherlands?", *C.H. Persoon s.n.* (H-ACH 1722A, lectotype n.v. [selected by Ahti (1993)]).

Plate 3, Figures 1-3 (Page 88).

Descriptions. – Ahti (2000: 237), Thomson (1967: 124).

Published color illustrations. – Brodo et al. (2001: 242 [fig. 217]), Hinds and Hinds (2007: 168 [fig. 50]).

Chemistry. – Fumarprotocetraric acid. – Spot tests: K+ dirty yellow, C-, KC-, P+ red, UV-.

Ecology. – *Cladonia caespiticia* is a common species that occurs on humus, bare soil, and the bases of trees (especially hardwoods). It typically occurs in shaded habitats with a history of low-grade persistent disturbance such as the compacted soil or duff on the margins of trails actively used by hikers.

Distribution. – *Cladonia caespiticia* is widespread and common throughout eastern North America with scattered occurrences in the Great Plains. It has also been reported from every other continent except Australia and Antarctica (see distribution map in Litterski & Ahti (2004)).

Discussion. – Morphologically, *Cladonia caespiticia* can be recognized by its thallus composed of delicate, finely divided primary squamules. The two other species with small squamules discussed in the proceeding sections differ in having robust simple squamules that never become finely divided. *Cladonia caespiticia* is clearly unrelated to the others discussed here because it is only superficially apodetiate. In fact, the apothecia of *C. caespiticia* are not sessile but rather borne on very short ecorticate podetia that give the appearance of a stipe (the reader will note that we have referred to the apothecia as "stipitate" or "pseudopodetiate" throughout this paper). *Cladonia caespiticia* is generally collected only when it is fertile because, as noted by Harris (1992), "only fools collect sterile *Cladonia*". As part of our study, we generated ITS sequences from several sterile *Cladonia* specimens with incised squamules

that were filed only to genus at NY because, although distinctive, they could not be identified with certainty. These sequences formed a monophyletic group with those generated from fertile specimens of *C. caespiticia.* Thus, we conclude that sterile *Cladonia* thalli on soil and humus from shaded habitats in eastern North America can be referred to this taxon on the basis of the presence of only fumarprotocetraric acid and delicate, incised, esorediate primary squamules.

Selected Specimens Examined. – **CANADA. NEWFOUNDLAND AND LABRADOR.** NEWFOUNDLAND: Bay of Islands, 9-10.viii.1901, *C.D. Howe & W.F. Lang 1162* (NY). **NOVA SCOTIA.** COLCHESTER CO.: Economy River Wilderness Area, 14.v.2001, *R.C. Harris 49763* (NY). **U.S.A. ALABAMA.** LEE CO.: Auburn, 12.ii.1897, *F.S. Earle & C.F. Baker s.n.* (NY). **ARKANSAS.** BAXTER CO.: Ozark National Forest, Leatherwood Wilderness, 18.iv.2005, *R.C. Harris 51164* (NY). JEFFERSON CO.: Pine Bluff Arsenal, 2.xii.1999, *D. Ladd 21965 & M. Pederson* (NY). **CONNECTICUT.** LITCHFIELD CO.: Town of Canaan, Robbins Swamp, 19.ix.2003, *R.C. Harris 47995* (NY). **DELAWARE.** SUSSEX CO.: near Piney Grove, 24.ii.1990, *C.F. Reed 13144* (NY). **GEORGIA.** ROCKDALE CO.: Panola Mountain State Park, 17.iv.2007, *J.C. Lendemer et al. 9001* (NY). RABUN CO.: 12.2 mi W of Clayon, 11.vi.1981, *R.C. Harris 13795* (NY). TOWNS CO.: Reed Branch Wet Meadow TNC Preserve, 12.xi.2007, *J.C. Lendemer et al. 10366* (NY). UNION CO.: Chattahoochee National Forest, along Duncan Ridge Trail, 6.x.1998, *R.C. Harris 42606* (NY). **ILLINOIS.** UNION CO.: Berryville Shale Glade Nature Preserve, 6.xi.2004, *R.C. Harris 50520* (NY). **INDIANA.** PUTNAM CO.: Fern, 1893, *L.M. Underwood 23* (NY). **KANSAS.** CHEROKEE CO.: 4 mi E of Baxter Springs, 13.vi.1950, *C.L. Kramer 180* (NY). WOODSON CO.: Lake Fegan, 9.ix.1950, *C.L. Kramer 574* (NY). **KENTUCKY.** BULLITT CO.: Bernheim Arboretum, 28.iii.2002, *D. Ladd 23624 & M. Ladd* (NY). LAUREL CO.: near Baldrock, 15.vi.1962, *C.F. Reed 58115* (NY). LETCHER CO.: Bad Branch Nature Preserve, 14.ix.1991, *R.C. Harris 27064* (NY). **MAINE.** HANCOCK CO.: T.10 SD, N of ME182, 27.vii.2006, *R.C. Harris 53086* (NY). KENNEBEC CO.: Mud Pond, 19.ix.1987, *R.C. Harris 20886* (NY). **MARYLAND.** ANNE ARUNDEL CO.: 1 mi E of Odenton, 23.iii.1962, *C.F. Reed 54279* (NY). BALTIMORE CO.: between Lutherville and Texas, 14.iii.1911, *C.C. Plitt s.n.* (NY). CAROLINE CO.: Rt. 404 near Ridgely, 20.iv.1962, *C.F. Reed 55305* (NY). DORCHESTER CO.: N of Vienna, 12.iv.1963, *C.F. Reed 61697* (NY). GARRETT CO.: Savage River State Forest, 23.ix.1989, *W.R. Buck 17586* (NY). MONTGOMERY CO.: Travilah Rd. near Piney Meetinghouse Rd., 11.iii.1966, *C.F. Reed 73391* (NY). WICOMICO CO.: 1 mi S of Upper Ferry, 22.iv.1962, *C.F. Reed 56061* (NY). WORCESTER CO.: Pocomoke Swamp, 22.iv.1962, *C.F. Reed 56084* (NY). **MASSACHUSETTS.** BERKSHIRE CO.: Mt. Greylock State Reservation, 6.v.1995, *R.C. Harris 36501* (NY). WORCESTER CO.: Oxford, 25.viii.1955, *V. Ahmadjian s.n.* (NY). **MICHIGAN.** CHEBOYGAN CO.: Carp Creek Gorge, 6.viii.1958, *J.T. Mikel L144* (NY). WASHTENAW CO.: W of Whitmore Lake, 10.vii.1979, *R.C. Harris 13133* (NY). **MINNESOTA.** LAKE CO.: Caribou Falls State Park, 9.vii.1978, *L. Brako 411* (NY). **MISSOURI.** BULTER CO.: Mark Twain National Forest, Mud Creek Natural Area, 16.x.2003, *R.C. Harris 48499* (NY).CARTER CO.: Peck Ranch Conservation Area, 16.iv.1997, *R.C. Harris 40428* (NY). JEFFERSON CO.: E of Don Robinson Rd., 12.x.2003, *R.C. Harris 48096* (NY). LINCOLN CO.: Cuiver River State Park, 23.v.2003, *A. Amtoft 1274* (NY). MONTGOMERY CO.: Graham Cave State Park, 27.x.2001, *R.C. Harris 45745* (NY). TANEY CO.: Mark Twain National Forest, Hercules Glades Wilderness, 22.v.2003, *R.C. Harris 47790* (NY). WAYNE CO.: Sam A. Baker State Park, 15.x.2003, *G. Guedian 1083* (NY). **NEW HAMPSHIRE.** GRAFTON CO.: Benton Trail, Mount Moosilauke, 4.vii.1935, *G.P. Anderson s.n.* (NY). **NEW JERSEY.** ATLANTIC CO.: Makepeace Wildlife Mangement Area, 31.iii.2007, *J.C. Lendemer 8744 & A. Moroz* (NY = *Lich. East. N. Amer. Exs. VII: 313*). BERGEN CO.: Closter, 1871, *C.F. Austin 507* (NY). BURLINGTON CO.: Atsion, 7.xi.1986, *M.G. Peidl 5071* (NY). MONMOUTH CO.: Allaire State Park, 5.ii.2009, *J.C. Lendemer 15427* (NY). OCEAN CO.: Manchester Wildlife Management Area, 5.ii.2009, *J.C. Lendemer 15365* (NY). SUSSEX CO.: Stokes State Forest, Tillman Ravine, 12.ix.1992, *R.C. Harris 27959* (NY). **NEW YORK.** ESSEX CO.: Town to Keene, Chapel Pond, 19.ix.2004, *R.C. Harris 50032* (NY). PUTNAM CO.: Town of Southeast, Peach Lake Natural Area, 21.xii.2006, *W.R. Buck 51194 & R.C. Harris* (NY). ROCKLAND CO.: Harriman State Park, 9.iii.2008, *J.C. Lendemer et al. 11550* (NY). ULSTER CO.: Town of Shandaken, W slope of Slide Mountain, 13.ix.2008, *J.C. Lendemer 14004* (NY). **NORTH CAROLINA.** CLAY CO.: Nantahala National Forest, 1-1.5 mi N of US64 on Buck Creek Road., 10.xi.2007, *J.C. Lendemer et al. 10439* (NY). GRAHAM CO.: Nantahala National Forest, along Santeetlah Creek, 6.viii.1994, *R.C. Harris 32944* (NY). JACKSON CO.: Cedar Cliff Mountain, 11.viii. 1994, *R.C. Harris 33031-A* (NY). STOKES CO.: sine loc., 10.iv.1939, *P.O. Schallert s.n.* (NY). WAKE CO.: along Barton Creek, 27.xi.1969, *C.F. Reed 95824* (NY). **OHIO.** SCIOTO CO.: Shawnee State Forest, 21.v.2006, *R.C. Harris 52734-A* (NY). SUMMITT CO.: near Akron, 3.ci.1892, *E.E. Bogue s.n.* (NY). **PENNSYLVANIA.** BRADFORD CO.: State Game Lands No. 36, 18.v.2009, *R.C. Harris 55158* (NY). CUMBERLAND CO.: Michaux State Forest, Woodrow Rd., 2.vi.2009, *J.C. Lendemer 18331* (NY). JEFFERSON CO.: Brookville, 6.ix.1987, *J.K. McGrath 511-17* (NY). LACKAWANNA CO.: Merli-Sarnoski County Park, 17.vii.2008, *J.C. Lendemer 13221* (NY). LANCASTER CO.: Susquehannock State Park, 3.i.2008, *J.C. Lendemer 13360 & E. Tripp* (NY). LYCOMING CO.: State Game Lands No. 133, 12.v.2009, *J.C. Lendemer 16680 & D. Atha* (NY). MONROE CO.: Delaware Water Gap National Recreation Area, Community Drive Wetlands, 24.iv.2004, *R.C. Harris 49524* (NY). PIKE CO.: Delaware State Forest, Bruce Lake Natural Area, 17.v.2009, *R.C. Harris 55152* (NY). SULLIVAN CO.: Eagle's Mere, 1937, *R.H. Torrey s.n.* (NY). TIOGA CO.: Tioga State Forest, W-facing slopes of Callahan Hill, 14.v.2009, *J.C. Lendemer 16903* (NY). WAYNE CO.: State Game Lands No. 312, 27.vii.2009, *J.C. Lendemer 18586* (NY). WYOMING CO.: State Game Lands No. 57, 21.vii.2008, *J.C. Lendemer 13864* (NY). **SOUTH CAROLINA.** GREENVILLE CO.: Bald Rock, 14.iii.1997, *R.C. Harris 40071* (NY). **TENNESSEE.** CARTER CO.: Doe River Gorge, 26.ix.1993, *R.C. Harris 30986* (NY). CHATHAM CO.: Sycamore, 30.iii.1934, *A.J. Sharp 3* (NY). **VERMONT.** ESSEX CO.: Town of Averill, Quimby Country Resort Property, 19.v.2008, *W.R. Buck 53753* (NY). **VIRGINIA.** BEDFORD CO.: 3 mi E Gillespe, 17.iv.1966, *C.F. Reed*

138969 (NY). FAIRFAX CO.: small branch of Turkey Run, 29.xi.1970, *J.C. Guccion 1089* (NY). HIGHLAND CO.: ~9 mi S of Monterey on US220, 10.v.1976, *R.C. Harris 10660* (NY). KING GEORGE CO.: Rt. 301 near Dogue, 4.iv.1961, *C.F. Reed 49192* (NY). RICHMOND CO.: 2 mi S Farnham, 26.v.1962, *C.F. Reed 60552* (NY). SYMTH CO.: Jefferson National Forest, Whitetop Mountain, 5.iv.2008, *R.C. Harris 54087* (NY). WILLIAMSBURG: College of William & Mary, 7.viii.2004, *B. Hodkinson 1628* (NY). WISE CO.: Jefferson National Forest, High Knob, 13.ix.1991, *R.C. Harris 26935* (NY). **WEST VIRGINIA.** POCAHONTAS CO.: Monongahela National Forest, 0-1 mi S of intersection of FS and CR 23, 21.x.2007, *J.C. Lendemer 9867 & A. Moroz* (NY). TUCKER CO.: Monongahela National Forest, Olsen's Bog, 22.iv.2001, *R.C. Harris 44859* (NY). **WISCONSIN.** LINCOLN CO.: Town of Rock Falls, 27.iv.2002, *R.C. Harris 45880* (NY). ONEIDA CO.: Patterson Hemlocks State Natural Area, 29.iv.2002, *R.C. Harris 46016* (NY).

3. *Cladonia petrophila* R.C. Harris, Brittonia, 44: 326. 1992. TYPE: U.S.A., Tennessee, Carter Co., Cherokee National Forest, Dennis Cove, 1976, *R.C. Harris 10730* (NY!, holotype).

PLATE 3, FIGURES 4-6 (PAGE 88); PLATE 4 (PAGE 93).

DESCRIPTION. – Harris (1992: 326).

PUBLISHED COLOR ILLUSTRATION. – Hinds and Hinds (2007: 195 [fig. 75]).

CHEMISTRY. – Chemotype I: sphaerophorin (major), atranorin (minor), fumarprotocetraric acid and accessories (major or minor). Spot tests: K+ weak yellow, C-, KC+ weak purple, P+ orange red (especially near the growing edge of the squamule), UV+ blue white (medulla). Chemotype II: sphaerophorin (major), ± atranorin (minor). Spot tests: K-, C-, KC-, P-, UV+ blue-white (medulla).

ECOLOGY. – As discussed by Harris (1992), *Cladonia petrophila* is restricted to shaded non-calcareous boulders and rock outcrops in intact hardwood forests, often near streams, streambeds, or habitats with high humidity. In particularly humid localities, the species can also occur on the roots and bases of hardwood trees; however, typical saxicolous thalli are always present in the immediate vicinity.

DISTRIBUTION. – *Cladonia petrophila* is known only from eastern North America where it is widely distributed in the Appalachian Mountains, Piedmont, and Ozark Ecoregion. A chemotype lacking fumarprotocetraric is restricted to the southern Appalachian Mountains (see specimens cited below) and outlying granite outcrops in the Piedmont of the southeastern United States.

DISCUSSION. – *Cladonia petrophila* is a common species throughout eastern North America and the Ozarks. It cannot be confused in the lab with any other *Cladonia* in the region because of its diminutive usually imbricate primarily squamulose thallus and the presence of sphaerophorin in the medulla. In the field, it could be confused with sterile thalli of species with esorediate primary squamules, particularly *C. ochrochlora* Flörke; however, it can be readily distinguished from these by its distinctive medullary chemistry. The distinction between *C. petrophila* and *C. stipitata* is addressed in the following section. It should be noted that examination of the holotype of *C. petrophila* revealed that the figure published as part of the protologue (Harris 1992: 327, fig. 1) illustrates pycnidia rather than apothecia (see plate 3, herein).

SELECTED SPECIMENS EXAMINED [FUMARPROTOCETRARIC ACID PRESENT CHEMOTYPE]. – **U.S.A. ALABAMA.** CLAY CO.: Talladega National Forest, 24.ix.1992, *R.C. Harris 28387* (NY). FRANKLIN CO.: Dismals Wonder Garden, 26.ix. 1992, *R.C. Harris 28455* (NY). JACKSON CO.: Buck's Pocket State Park, 3.x.1998, *R.C. Harris 42379* (NY). LEE CO.: Auburn, 20.ii.1897, *F.S. Earle 125 & C.F. Baker* (NY). TALLAPOOSA CO.: Double Bridges, 5.xi.1898, *F.S. Earle s.n.* (NY). WINSTON CO.: Natural Bridge, 26.ix.1992, *R.C. Harris 28488* (NY). **ARKANSAS.** CRAWFORD CO.: Ozark National Forest, along FS 1725 (CR257), 15.iv.2004, *R.C. Harris 49186* (NY). FRANKIN CO.: Ozark National Forest, Shores Lake, 16.iv.2004, *R.C. Harris 49201* (NY). IZARD CO.: NE corner of Devil's Knob-Devil's Backbone, 24.x.2001, *R.C. Harris 45379* (NY). NEWTON CO.: Ozark National Forest, Alum Cove Recreation Area, 24.ix.1988, *R.C. Harris 21472* (NY). STONE CO.: Ozark National Forest, City Rock Bluff Special Interest Area, 18.iv.2005, *R.C. Harris 51249* (NY). **CONNECTICUT.** FAIRFIELD CO.: Town of Redding, 9.vi.2005, *R.C. Harris 51547* (NY). WINDHAM CO.: Town of Ashford, 24.vii.2002, *R.C. Harris 46094* (NY). **GEORGIA.** COFFEE CO.: Broxton Rocks Ecological Preserve, 7.x.1999, *W.R. Buck 36609* (NY). GILMER CO.: Chattahoochee National Forest, Barnes Creek Picnic Area, 22.ix.1992, *R.C. Harris 28192* (NY). JEFF DAVIS CO.: 0.4 mi E of Coffee Co. Line, 18.ix.1996, *R.C. Harris 38770* (NY). **ILLINOIS.** JACKSON CO.: Shawnee National Forest, Pomona Natural Bridge, 15.x.1993, *R.C. Harris 31285* (NY). POPE CO.: Shawnee National Forest, Hayes Creek, 16.x.1993, *R.C. Harris 31373* (NY). RANDOLPH CO.: Piney Creek Ravine Nature Preserve, 7.xi.2004, *R.C. Harris 50588* (NY). **KENTUCKY.** BATH CO.: Daniel Boone National Forest, Tater Knob, 10.x.1995, *R.C. Harris 36875* (NY). BULLITT CO.: Bernheim Arboretum and

Research Forest, 25.iii.2002, *D. Ladd 23455 & M. Ladd* (NY). BULTER CO.: Union-Boston area, 17,.vi.1962, *C.F. Reed 58940* (NY). EDMONSON CO.: Area of Temple Hill Cemetery, ix.1979, *J.P. Dey et al. 10985* (NY). ESTILL CO.: Daniel Boone National Forest, ca. 1.5 mi NW of Cottage Furnace Campground, 11.x.1995, *R.C. Harris 36963* (NY). HARLAN CO.: Profile Rock, Kentenia State Forest, 16.ix.1991, *R.C. Harris 27193* (NY). LETCHER CO.: Bad Branch Nature Preserve, 14.ix.1991, *R.C. Harris 26997* (NY). PERRY CO.: Daniel Boone National Forest, Old Field Branch of Leatherwood Creek, 6.x.2001, *R.C. Harris 44946* (NY). WOLFE CO.: Red River Gorge, 1.v.1981, *C.F. Reed 113186* (NY). **MARYLAND.** BALTIMORE CO.: Bear Island, 12.ii.1982, *C.F. Reed 114782* (NY). CECIL CO.: mouth of Conowingo Creek, 17.iii.1962, *C.F. Reed 55209* (NY). HARFORD CO.: along Deer Creek at US 1, 24.iv.1988, *C.F. Reed 127060* (NY). MONTGOMERY CO.: Rt. 28, just S of Dawsonville, 19.iv.1962, *C.F. Reed 55780* (NY). WASHINGTON CO.: Pleasant Valley Rd. at Rt. 77, 28.iv.1962, *C.F. Reed 55595* (NY). **MASSACHUSETTS.** BERKSHIRE CO.: Bartholomew's Cobble, 1982, *R.C. Harris s.n.* (NY). NORFOLK CO.: Chickatawbut Hill, 18.iv.1992, *E. Lay et al. 93-020* (NY). **MISSISSIPPI.** TISHOMINGO CO.: Tishomingo State Park, 27.ix. 1992, *R.C. Harris 28570* (NY). **MISSOURI.** DOUGLAS CO.: Mark Twain National Forest, Dimcher Hollow, 11.x.1997, *R.C. Harris 41429* (NY). IRON CO.: E slope of Royal Gorge, 27.iv.1988, *R.C. Harris 21784* (NY). JEFFERSON CO.: Don Robinson Property, 24.iii.2006, *R.C. Harris 51980* (NY). LAWRENCE CO.: Fall Hollow Gorge, 27.iii.2006, *R.C. Harris 51235* (NY). PHELPS CO.: Mark Twain National Forest, Roluf Spring Woodland Resoration Area, 6.ii.1994, *D. Ladd et al. 17842* (NY). ST. CLAIR CO.: Buzzard Bluff, 22 iv.1988, *R.C. Harris 21257* (NY). ST. FRANCOIS CO.: St. Francois State Park, 13.x.2003, *R.C. Harris 48181* (NY). ST. GENEVIEVE CO.: Pickle Springs Natural Area, 26.ix.1990, *R.C. Harris 25989* (NY). WAYNE CO.: Sam A. Baker State Park, 15.x.2003, *W.R. Buck 45379* (NY). **NEW JERSEY.** PASSAIC CO.: Ringwood, 7.xi.1935, *G.P. Anderson s.n.* (NY). SUSSEX CO.: Stokes State Forest, 12.ix.1992, *R.C. Harris 27956* (NY). **NEW YORK.** BRONX CO.: New York Botanical Garden, 10.v.1980, *R.C. Harris 13294* (NY). DUTCHESS CO.: Cary Aboretum, 14.x.1981, *R.C. Harris 14050* (NY). GREENE CO.: Long Path, 9.v.1993, *R.C. Harris 30472* (NY). ORANGE CO.: Harriman State Park, 19.iv.1998, *R.C. Harris 42138* (NY). PUTNAM CO.: Town of Putnam Valley, 27.x.1998, *R.C. Harris 42827* (NY). ROCKLAND CO.: Harriman State Park, 26.iii.1997, *R.C. Harris 40359* (NY). WESTCHESTER CO.: Mianus River Gorge, 16.v.1981, *R.C. Harris 13585* (NY). **NORTH CAROLINA.** CLAY CO.: Nantahala National Forest, Buck Creek Barren, 10.xi.2007, *J.C. Lendemer et al. 10867* (NY). HAYWOOD CO.: Great Smoky Mountains National Park, Big Creek, 25.viii.1977, *J.W. Thomson 19577* (NY). JACKSON CO.: Bad Creek Trail to Ellicott's Rock, 28.ix.1989, *R.C. Harris 24857* (NY). MACON CO.: Nantahala National Forest, Glen Falls, 17.vii.1996, *W.R. Buck 30274* (NY). **OHIO.** GALLIA CO.: Wayne National Forest, Symmes Creek Natural Area, 21.v.2006, *W.R. Buck 50325* (NY). SCIOTO CO.: Shawnee State Forest, along Pond Like Run, 21.v.2006, *R.C. Harris 52761* (NY). **PENNSYLVANIA.** BEDFORD CO.: Buchanan State Forest, Pleasant Valley, 17.v.2006, *R.C. Harris 52589* (NY). BERKS CO.: French Creek State Park, 27.xii.2006, *J.C. Lendemer 8272 & A. Moroz* (NY). BLAIR CO.: State Game Lands No. 73, 22.iv.2008, *R.C. Harris 54294* (NY). BUCKS CO.: Ringing Rocks County Park, 15.ix.2005, *J.C. Lendemer 4940 & A.E. Schuyler* (NY). HUNTINGDON CO.: Trough Creek State Park, 22.iv.2008, *R.C. Harris 25257* (NY). LACKAWANNA CO.: SGL No. 300, 3.vii.2008, *J.C. Lendemer 12417* (NY). LUZERNE CO.: SGL No. 91, 15.vii.2008, *J.C. Lendemer 13152* (NY). MONROE CO.: Delaware Water Gap National Recreation Area, Mount Minsi, 3.v.2006, *J.C. Lendemer 6818 & N. Howe* (NY). MONTGOMERY CO.: Fulshaw Craeg Preserve, 9.iv.2004, *J.C. Lendemer 2143 & A.F. Rhoads* (NY, PH). PIKE CO.: SGL No. 180, 11.vii.2008, *J.C. Lendemer 12975* (NY). **RHODE ISLAND.** PROVIDENCE CO.: Town of Lincoln, 17.ix.2006, *R.C. Harris 53204* (NY). WASHINGTON CO.: Town of Hopkinton, 16.ix.2006, *R.C. Harris 51379* (NY). **SOUTH CAROLINA.** LEXINGTON CO.: Peachtree Rock Nature Preserve, 13.iii.1997, *R.C. Harris 39914* (NY). PICKENS CO.: along Eastatoe Creek ~2.5 mi SW of Rocky Bottom, 27.ix.1989, *R.C. Harris 24785* (NY). SPARTANSBURG/LAURENS CO.: Rt. 101 at Enoree River, 20.iv.1982, *C.F. Reed 117896* (NY). **TENNESSEE.** BLOUNT CO.: Great Smoky Mountains National Park, Cades Cove, 23.vii.1977, *R.W. Becking 77071318* (NY). HAMILTON CO.: Lookout Mountain, *W.W. Calkins s.n.* (NY). MONROE CO.: Cherokee National Forest, Bald River Falls Quad., 6.viii.1994, *R.C. Harris 32897* (NY). SCOTT CO.: Big South Fork National River and Recreation Area, 7.viii.1994, *R.C. Harris 32978* (NY). SEVIER CO.: Greenbrier, 5.viii.1977, *R.W. Becking 7708061* (NY). **VERMONT.** ADDISON CO.: Bristol Cliffs Wilderness Area, 16.ix.2000, *E. Lay 0059* (NY). **VIRGINIA.** GILES CO.: Mountain Lake Biological Station, Moonshine Dell, 7.x.1995, *R.C. Harris 36723* (NY). WARREN CO.: Smithsonian Conservation & Research Center, 11.iii.2005, *J.C. Lendemer 3845* (NY). **WEST VIRGINIA.** GRANT CO.: Greenland Gap, 21.iv.2001, *R.C. Harris 44841* (NY). **WISCONSIN.** RICHLAND CO.: Rockbridge Park, 28.vii.1974, *M. Nee 13150* (NY).

Selected specimens examined [FUMARPROTOCETRARIC ACID ABSENT CHEMOTYPE]. – **U.S.A. ALABAMA.** JACKSON CO.: Pisgah, Jones Cove, 2.x.1999, *R.C. Harris 43352* (NY). MARION CO.: North Fork Creek, 4.x.1999, *R.C. Harris 43425* (NY). **GEORGIA.** HEARD CO.: Camp Meeting Rock Preserve, 1.x.1999, *R.C. Harris 43310* (NY). PUTNAM CO.: Eatonon Granite Outcrop, along W shore of Oconee Lake, 8.x.1999, *R.C. Harris 43726* (NY). TOWNS CO.: Southern Nantahala Wilderness, Hightower Gap to Rich Knob, 11.xi.2007, *J.C. Lendemer et al. 10973* (NY). **NORTH CAROLINA.** HAYWOOD CO.: Great Smoky Mountains National Park, 3 mi SE of Waterville, 28.x.2006, *J.C. Lendemer 8208 & E. Tripp* (NY). JACKSON CO.: Cedar Cliff Mountain, 11.viii.1994, *R.C. Harris 33084* (NY). MACON CO.: Nantahala National Forest, Wayah Bald, 30.ix.1997, *R.C. Harris 40968* (NY). TRANSYLVANIA CO.: Gorges State Park, ~1/2 mi N of Ray Fisher Farm, 9.viii.2005, *J.C. Lendemer 4690 & E.A. Tripp* (NY). **TENNESSEE.** MONROE CO.: Cherokee National Forest, Bald River Falls Quad., 6.viii.1994, *W.R. Buck 25164* (NY).

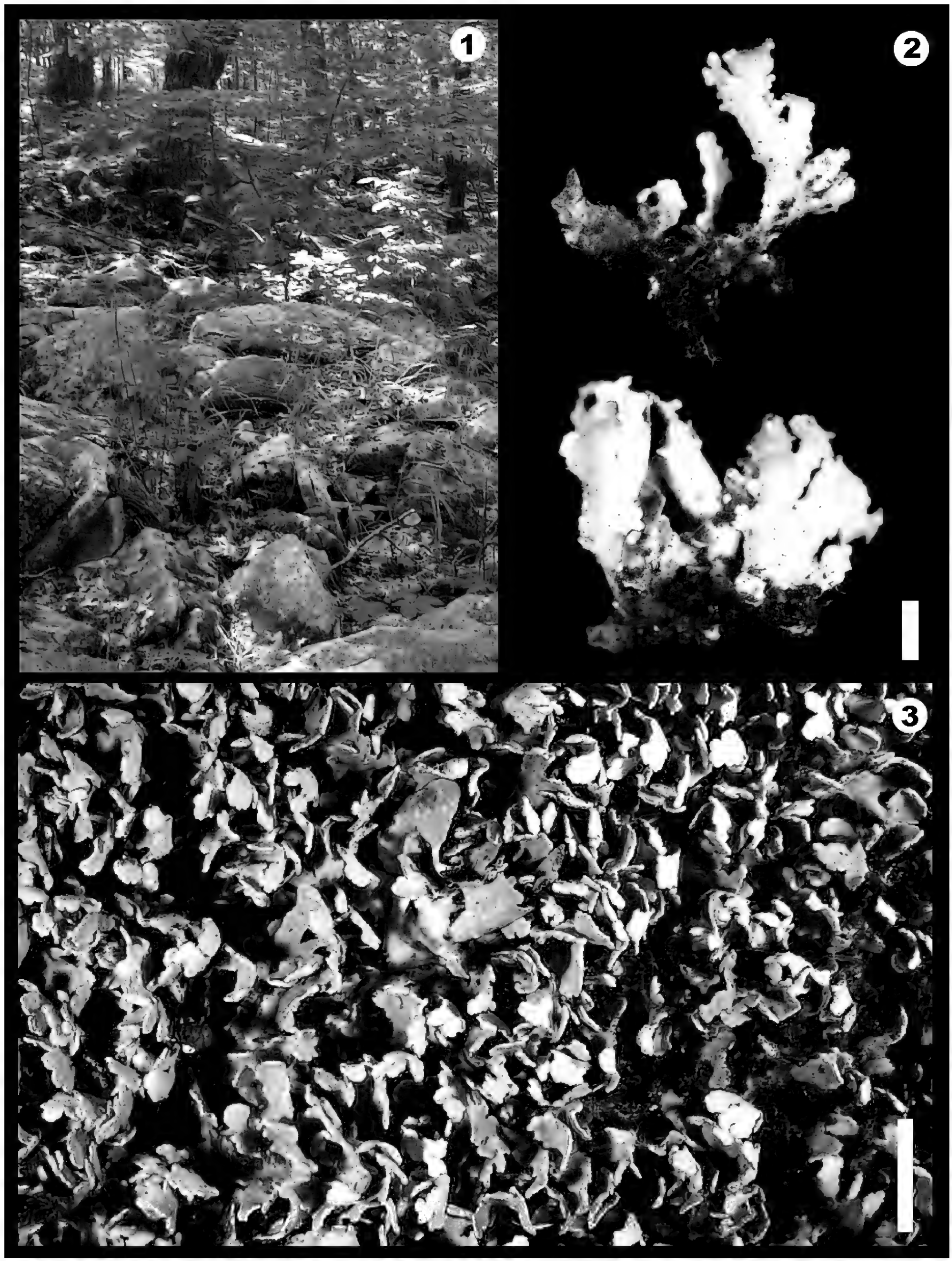


Plate 4. *Cladonia petrophila*. Figure 1, typical habitat (Pike Co., Pennsylvania, USA). Figure 2, detail of the primary squamules (*Buck 50325*, scale = 1 mm). Figure 3, thallus (*Buck 53025*, scale = 5 mm).

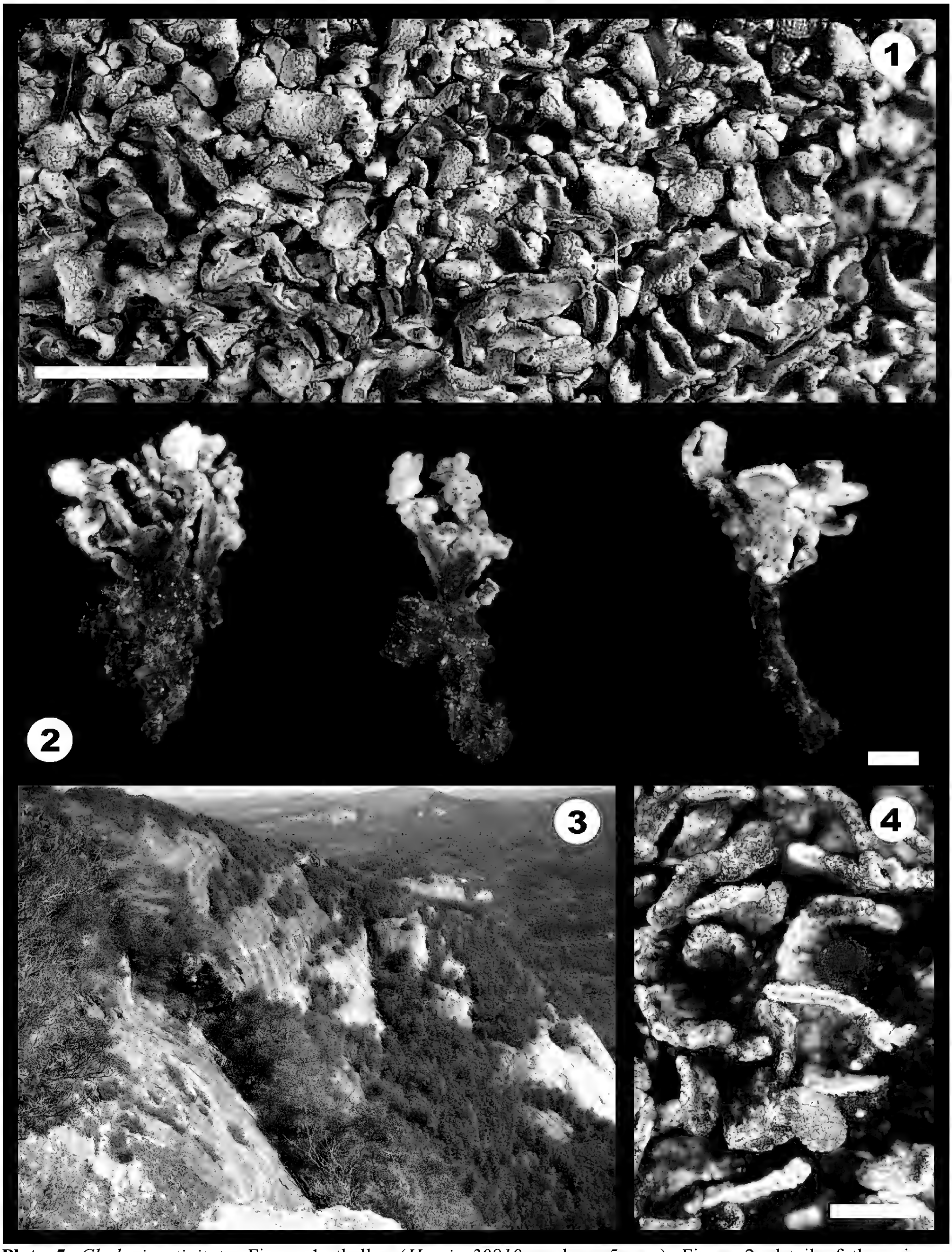


Plate 5. *Cladonia stipitata.* Figure 1, thallus (*Harris 30810*, scale = 5 mm). Figure 2, detail of the primary squamules (*Harris 38010*, scale = 1mm). Figure 3, typical habitat (Jackson Co., North Carolina, USA, photo by E.A. Tripp). Figure 4, detail of apothecium (*Lendemer 7615*, scale = 2 mm).

4. *Cladonia stipitata* Lendemer & Hodkinson sp. nov.

Mycobank. #515515

PLATE 5 (PAGE 94).

Similis *C. petrophilae* apotheciis sessilibus sed differt squamulis stipitatibus, acidum sphaerophoricum nullum et acidum atranoricum contintente.

TYPE: **U.S.A. NORTH CAROLINA.** TRANSYLVANIA CO.: Gorges State Park, SW face of Grassy Ridge, Snake Rock, 3150-3200 ft., exposed granitic bald with extensive bryophyte-*Selaginella* cushions, on steep slope marginally forested by pitch pine (*Pinus rigida*), oak (*Quercus*), and sourwood, 19.ix.2005, on granite in full sun, *J.C. Lendemer 7615 & A. Moroz* (NY, holotype; DUKE, isotype).

DESCRIPTION. – **Primary thallus** squamulose, forming distinct cushion-like colonies up to several centimeters in diameter. **Squamules** digitate, dichotomously branching, crowded, erect, forming tight dense cushions, not distinctly recurved near the tips, 0.7-1.25 mm wide, (2.5)-5-8.75 mm long, with multiple central cartilaginous strands; upper surface blue-gray though often discolored to brownish near the tips; lower surface white; margins and tips crenate. **Podetia** absent. **Apothecia** frequently present, although, mature apothecia not observed, sessile, plane, reddish-brown darkening to blackish-brown, ca. 0.5 mm in diameter. **Pycnidia** sessile on the squamules, reddish-brown, darkening to blackish, subglobose to pyriform, ca. 0.5 mm diam, occasionally elongating apically to becoming ca. 1.0 mm tall. **Conidia** hyaline, short and rod-like, often slightly curved, (7.7)-8.9-(10.2) x 0.75-1 µm.

ETYMOLOGY. – The epithet "stipitata" refers to the distinctive stipitate morphology of the primary squamules of the species.

CHEMISTRY. – Atranorin (major), fumarprotocetraric acid (major). Spot tests: K+ yellow, C-, KC+ weak purple, P+ orange-red (especially near the growing edge of the squamules), UV-.

ECOLOGY. – *Cladonia stipitata* is essentially restricted to fully exposed rock slabs and boulders on granitic balds at middle to low elevations (e.g., 2000-3000 ft.) of the southern Appalachian Mountains. To date, the species has not been found in the humid shaded hardwood forests that typically surround the granitic balds where it occurs. It has also not been found in similar habitats at the highest elevations of the southern Appalachians (e.g., >3000 ft.).

DISTRIBUTION. – *Cladonia stipitata* is presently known only from a handful of localities in the southern Appalachian Mountains (in Georgia, Kentucky, North Carolina, and South Carolina) and from a single disjunct population on an exposed granite outcrop near sea level in Rhode Island. The occurrence of this disjunct population of *C. stipitata* suggests that the species may actually have a typical Appalachian-Great Lakes distribution and that exhaustive searching of regional herbaria or additional fieldwork would turn up additional records. It should be noted, however, that our attempts to locate the species in seemingly appropriate habitats outside of its currently documented range (e.g., in Maryland, Pennsylvania, and Virginia) were unsuccessful.

HISTORY OF STUDY. – We were first alerted to the existence of *Cladonia stipitata* when the first author (JCL) and Erin Tripp collected it during a survey of the lichens of Gorges State Park in North Carolina. Considerable study by JCL and Richard Harris failed to resolve its status, and despite its aberrant ecology, chemistry, and distinctly stipitate squamules it was reported by Lendemer & Tripp (2008) as "*Cladonia petrophila* s.l.". In an effort to better understand the species, a specimen that had been deposited at DUKE was studied with molecular methods as part of the AFTOL project and sequences generated from that specimen were included in the dataset used to produce the inferred phylogeny of the Lecanoromycetes by Miadlikowska et al. (2006). As a result of that study, this species is now represented in GenBank by nucSSU, nucLSU, *RPB*1, *RPB*2, and mitSSU sequences. Unfortunately, Miadlikowska et al. (2006) included this sample under the name "*Cetradonia* sp." based on the specimen label and the initial communication from JCL suggesting that molecular data might resolve whether the taxon should be included in *Cetradonia* J.C. Wei & Ahti or *Cladonia*. It was only after additional collections of this taxon were discovered and we generated additional sequences for it and other apodetiate *Cladonia* species that we decided that formal recognition was required.

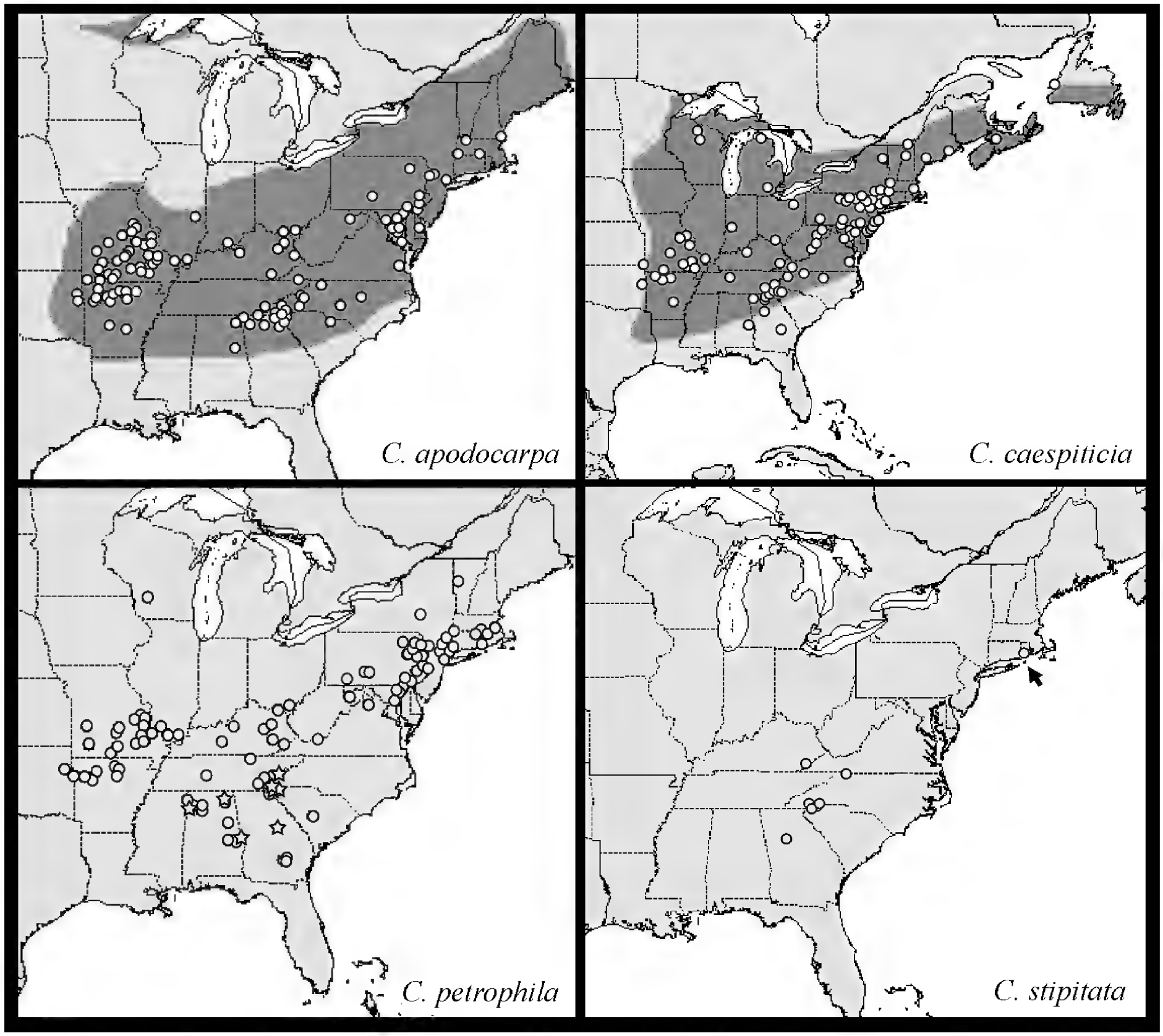


Plate 6. Geographic distributions of *C. apodocarpa* (shaded region is distribution mapped by Brodo et al. (2001)), *C. caespiticia* (shaded region is distribution mapped by Brodo et al. (2001) excluding disjunction in Nebraska), *C. petrophila* (stars = chemotype fumarprotocetraric acid lacking), and *C. stipitata* (arrow points to Rhode Island population).

Discussion. – Among the apodetiate species of *Cladonia* with sessile apothecia borne on the squamules found in eastern North America, *C. stipitata* can be recognized by its unique ecology, restricted distribution, and stipitate squamules with a blackened base. Morphologically, the species resembles *C. petrophila*, which also occurs on non-calcareous rocks; however, *C. petrophila* is restricted to shaded habitats in intact forests, consistently produces sphaerophorin in the medulla, and produces atranorin only as a minor substance that is usually detectable as only a trace with TLC. Chemically, the species is identical to *C. apodocarpa* in producing high concentrations of atranorin and fumarprotocetraric acid; however, that species occupies an entirely different habitat (soil and humus in disturbed open areas) and has much longer squamules that are not distinctly stipitate or blackened at the base.

The discovery of a new species of *Cladonia* that is essentially restricted to exposed granitic balds in the southern Appalachian Mountains is not surprising when one considers how poorly collected the middle and low elevations of the mountain range are in that region (Lendemer & Tripp 2008). An endemic monotypic genus, *Cetradonia* J.C. Wei & Ahti, is already known from shaded granitic seepage faces in the same region and ongoing studies by the authors and their colleagues continue to result in the discovery of previously unrecognized disjunct

and endemic taxa (e.g., Harris & Lendemer 2009; Hodkinson in press; Lendemer 2007, 2009, 2009a, 2009b; Lendemer et al. 2008; Lendemer & Tripp 2008; Sheard et al. 2008).

Additional Specimens Examined. – **U.S.A. GEORGIA.** RABUN CO.: Chattahoochee National Forest, Rabun Bald, 20.ix.1996, *R.C. Harris 38964* (NY). ROCKDALE CO.: Panola Mountain State Park, 17.iv.2007, *J.C. Lendemer 8994* (NY). **KENTUCKY.** HARLAN CO.: Profile Rock, Kentenia State Forest, 16.ix.1991, *R.C. Harris 27148* (NY). **NORTH CAROLINA.** JACKSON CO.: Nantahala National Forest, Panthertown Valley, 29.iv.2006, *R.C. Harris 52488* (NY), *J.C. Lendemer et al. 6905* (NY). TRANSYLVANIA CO.: Gorges State Park, 9.vii.2005, *J.C. Lendemer 4689 & E. Tripp* (DUKE), *J.C. Lendemer 4856 & E. Tripp* (NY, DUKE, AFToL voucher #1657). WILKES CO.: Stone Mountain State Park, 23.ix.1993, *R.C. Harris 30810* (NY). **RHODE ISLAND.** WASHINGTON CO.: Town of Hopkinton, Long & Ell Ponds Natural Area, 16.ix. 2006, *R.C. Harris 53180* (NY). **SOUTH CAROLINA.** GREENVILLE CO.: Bald Rock, 14.iii.1997, *R.C. Harris 40063* (NY); vicinity of Bald Rock, 5.x.1999, *R. Yahr 1987* (DUKE). PICKENS CO.: 1.5 mi N of Liberty on Hwy 178, 21.vi.1973, *J.N. Knox 125* (DUKE).

Acknowledgements

We thank Richard Harris for his helpful discussions of *C. petrophila* and other sterile *Cladonia*. Thanks to Teuvo Ahti and Erin Tripp for reviewing the manuscript. The second author thanks François Lutzoni and Jolanta Miadlikowska for training in phylogenetic methods. Special thanks to Sean Beeching, Bill Buck, Richard Harris, Malcolm Hodges, Andy Moroz, and Erin Tripp for their companionship and help with logistics associated with fieldwork. Fieldwork carried out by the first author was funded in part by the Department of Conservation and Natural Resources of the Commonwealth of Pennsylvania (DCNR), New York Botanical Garden (NYBG), Western Pennsylvania Conservancy (WPC), and the Zalk Travel Fund of the City University of New York (CUNY). Thanks also to the following for providing the first author with permission to collect in their respective regions: United States Forest Service (Nantahala National Forest), United States National Park Service (Delaware Water Gap National Recreation Area, Great Smoky Mountains National Park), DCR of Virginia, DCNR of Pennsylvania, Pennsylvania State Game Commission, The Nature Conservancy, and Western Pennsylvania Conservancy. Molecular data was gathered using the facilities of the Lewis B. and Dorothy Cullman Laboratory at NYBG.

Literature Cited

Ahti, T. 1993. Names in current use in the Cladoniaceae (lichen-forming Ascomycetes) in the ranks of genus to variety. *In:* Greuter, W (ed.): NCU-2. Names in Current Use in the Families Trichocomaceae, Cladoniaceae, Pinaceae, and Lemnaceae. Regnum Vegetabile vol. 128. Koeltz Scientific Books, Königstein, Germany, pp. 58-106.

Ahti, T. 2000. Cladoniaceae. Flora Neotropica, 78, Organization for Flora Neotropica and New York Botanical Garden, Bronx. 362 pp.

Altschul, S., T.L. Madden, A.A. Schaffer, J. Zhang, Z. Zhang, W. Miller, and D.J. Lipman. 1997. Gapped BLAST and PSI-BLAST: a new generation of protein database search programs. Nucleic Acids Research, 25: 3389-3402.

Amtoft, A., F. Lutzoni, and J. Miadlikowska. 2008. *Dermatocarpon* (Verrucariaceae) in the Ozark Highlands, North America. The Bryologist, 111(1): 1-40.

Argüello, A., R. del Prado, P. Cubas, and A. Crespo. 2007. *Parmelina quercina* (Parmeliaceae, Lecanorales) includes four phylogenetically supported morphospecies. Biological Journal of the Linnean Society, 91: 455-467.

Arup, U. 2006. A new taxonomy of the *Caloplaca citrina* group in the Nordic countries, except Iceland. The Lichenologist, 38(1): 1-20.

Beiggi, S., and M.D. Piercey-Normore. 2007. Evolution of ITS ribosomal RNA secondary structures in fungal and algal symbionts of selected species of *Cladonia* sect. *Cladonia* (Cladoniaceae, Ascomycotina). Journal of Molecular Evolution, 64(5): 528-42.

Brodo, I.M., S.D. Sharnoff and S. Sharnoff. 2001. Lichens of North America. Yale University Press, New Haven, London. 795 pp.

Culberson, C.F., and H. Kristinsson. 1970. A standardized method for the indentification of lichen products. Journal of Chromatography, 46: 85–93.

Evans, A.W. 1930. The Cladoniae of Connecticut. Transactions of the Connecticut Academy of Arts and Science, 30: 357-510.

Felsenstein J. 1985. Confidence limits on phylogenies: An approach using the bootstrap. Evolution, 39: 783-791.

Gaya, E., P. Navarro-Rosinés, X. Llimona, N. Hladun, and F. Lutzoni. 2008. Phylogenetic reassessment of the Teloschistaceae (lichen-forming Ascomycota, Lecanoromycetes). Mycological Research, 112: 528-546.

Gaya, E., F. Lutzoni, S. Zoller, and P. Navarro-Rosinés. 2003. Phylogenetic study of *Fulgensia* and allied *Caloplaca*, and *Xanthoria* species (Teloschistaceae, lichen-forming Ascomycota). American Journal of Botany, 90: 1095-1103.

Harris, R.C. 1992. *Cladonia petrophila*, a new species from eastern North America. Brittonia, 44(3): 326-330.

Harris, R.C. and J.C. Lendemer. 2009. The *Fellhanera silicis* group in eastern North America. Opuscula Philolichenum, 6: 157-174.

Hinds, J.W. and P.L. Hinds. 2007. The Macrolichens of New England. Memoirs of the New York Botanical Garden No. 96. New York Botanical Garden Press, Bronx, New York. 584 pp.

Hodkinson, B.P. In press. A first assessment of lichen diversity for one of North America's "biodiversity hotspot" in the Southern Appalachians of Virginia. Castanea, 75.

Hodkinson, B.P. and J.C. Lendemer. In rev. Molecular analyses reveal distantly-related cryptic species in *Xanthoparmelia tasmanica*. Bibliotheca Lichenologica.

Hodkinson, B.P. and F. Lutzoni. 2009 A microbiotic survey of lichen-associated bacteria reveals a new lineage from the Rhizobiales. Symbiosis, 49: 163-180.

Hillis, D.M., C. Morritz, and B.K. Mabel. 1996. Molecular Systematics (2nd ed.). Sinauer Associates Inc., Sunderland, Massachusetts USA.

Jahns, H.M. and H.A. Beltman. 1973. Variations in the ontogeny of fruiting bodies in the genus *Cladonia* and their taxonomic and phylogenetic significance. The Lichenologist, 5: 349-367.

Juneau, K., M. Miranda, M.E. Hillenmeyer, C. Nislow, and R.W. Davis. 2006. Introns regulate RNA and protein abundance in Yeast. Genetics, 174: 511-518.

Kjer, K.M. 1995. Use of rRNA secondary structure in phylogenetic studies to identify homologous positions: an example of alignment and data presentation from the frogs. Molecular Phylogenetics and Evolution, 4(3): 314-330.

Larkin M.A., G. Blackshields, N.P. Brown, R. Chenna, P.A. McGettigan, H. McWilliam, F. Valentin, I.M. Wallace, A. Wilm, R. Lopez, J.D. Thompson, T.J. Gibson, and D.G. Higgins. 2007. ClustalW and ClustalX version 2. Bioinformatics, 23(21): 2947-2948.

Litterski, B. and T. Ahti. 2004. World distribution of selected European *Cladonia* species. Symbolae Botanicae Upsaliensis, 34(1): 205-236.

Lendemer, J.C. 2007. *Megalaria beechingii*, a new species from the southern Appalachian Mountains of eastern North America. Opuscula Philolichenum, 4: 41-44.

Lendemer, J.C. 2009. A synopsis of the lichen genus *Heterodermia* (Physciaceae, lichenized ascomycota) in eastern North America. Opuscula Philolichenum, 6: 1-36.

Lendemer, J.C. 2009a. *Opegrapha moroziana* (Roccellaceae, Lichenized Ascomycetes), a new sorediate saxicolous species from eastern North America. Opuscula Philolichenum, 6: 51-54.

Lendemer, J.C. 2009b. *Pertusaria andersonii* (Pertusariaceae, Lichenized Ascomycetes), a new species from high elevations of the southern Appalachian Mountains in eastern North America. Opuscula Philolichenum, 6: 55-58.

Lendemer, J.C., R.C. Harris, and J.A. Elix. 2008. *Pertusaria appalachensis*, a new species from North America. Opuscula Philolichenum, 5: 77-82.

Lendemer, J.C. and B.P. Hodkinson. In rev. A new perspective on *Punctelia subrudecta* (Parmeliaceae) in North America: previously rejected morphological characters corroborate phylogenetic hypotheses and provide insight into an old problem. The Lichenologist.

Lendemer, J.C. and E. Tripp. 2008. Contributions to the lichen flora of North Carolina: a preliminary checklist of the lichens of Gorges State Park. The Bryologist, 111(1): 4-67.

Lutzoni, F., P. Wagner, V. Reeb, and S. Zoller. 2000. Integrating ambiguously aligned regions of DNA sequences in phylogenetic analyses without violating positional homology. Systematic Biology, 49: 628–651.

Maddison, W.P. and D.R. Maddison. 2009. Mesquite: A Modular System for Evolutionary Analysis. Version 2.6. http://mesquiteproject.org.

Miadlikowska, J., B. McCune, and F. Lutzoni. 2002. *Pseudocyphellaria perpetua*, a new lichen from Western North America. The Bryologist, 105: 1-10.

Miadlikowska, J., F. Kauff, V. Hofstetter, E. Fraker, M. Grube, J. Hafellner, V. Reeb, B.P. Hodkinson, M. Kukwa, R. Lücking, G. Hestmark, M.G. Otalora, A. Rauhut, B. Büdel, C. Scheidegger, E. Timdal, S. Stenroos, I.M. Brodo, B.G. Perlmutter, D. Ertz, P. Diederich, J.C. Lendemer, P.F. May, C. Schoch, A.E. Arnold, C. Gueidan, E.A. Tripp, R. Yahr, C. Robertson, and F. Lutzoni. 2006. New insights into classification and evolution of the Lecanoromycetes (Pezizomycotina, Ascomycota) from phylogenetic analyses of three ribosomal RNA- and two protein-coding genes. Mycologia, 98(6): 1088-1103.

Myllys, L., S. Stenroos, A. Thell, and T. Ahti. 2003. Phylogeny of bipolar *Cladonia arbuscula* and *Cladonia mitis* (Lecanorales, Euascomycetes). Molecular Phylogenetics and Evolution, 27(1): 58-69.

Nelsen, M.P., R. Lücking, L. Umaña, M.T. Trest, S. Will-Wolf, J.L. Chaves, and A. Gargas. 2007. *Multiclavula ichthyiformis* (Fungi: Basidiomycota: Cantharellales: Clavulinaceae), a remarkable new basidiolichen from Costa Rica. American Journal of Botany, 94(8): 1289-1296.

Parenteau, J., M. Durand, S. Véronneau, A. Lacombe, G. Morin, V. Guérin, B. Cecez, J. Gervais-Bird, C. Koh, D. Brunelle, R.J. Wellinger, B. Chabot, and S.A. Elela. 2008. Deletion of many yeast introns reveals a minority of genes that require splicing for function. Molecular Biology of the Cell, 19(5): 1932-1941.

Robbins, C.A. 1925. *Cladonia apodocarpa*, a new species. Rhodora, 27: 210-211.

Sheard, J.W., J.C. Lendemer, and E. Tripp. 2008. *Buellia japonica* (Physciaceae, lichenized Ascomycetes), a new report for North America. The Bryologist, 111(1): 124-127.

Stamatakis, A. 2006. RAxML-VI-HPC: maximum likelihood-based phylogenetic analyses with thousands of taxa and mixed models. Bioinformatics, 22: 2688-2690.

Stenroos, S., J. Hyvönen, L. Myllys, A. Thell, and T. Ahti. 2002. Phylogeny of the genus *Cladonia* s.lat. (Cladoniaceae, Ascomycetes) inferred from molecular, morphological, and chemical data. Cladistics, 18: 237-278.

Swofford, D.L. 2001. PAUP*. Phylogenetic Analysis Using Parsimony (*and Other Methods). Version 4. Sinauer Associates, Sunderland, Massachusetts.
Thomson, J.W. 1967. The Lichen Genus *Cladonia* in North America. University of Toronto Press, Toronto. xi + 172 pp.
White, T.J., T.D. Bruns, S. Lee, and J. Taylor. 1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In PCR Protocols: a guide to methods and applications (M.A. Innis, D.H. Gelfand, J.J. Sninsky & T.J. White, eds): 315–322. Academic Press, San Diego.

Appendix I

Data for molecular vouchers and GenBank accessions for ITS sequences generated as part of this study.

Taxon	Chemotype	Isolate No.	GenBank No.	Collection	Locality
C. apodocarpa		NY373	GU207223	J.C. Lendemer 11561	U.S.A., New Jersey, Sussex Co.
		NY374	GU207224	J.C. Lendemer 10769	U.S.A., North Carolina, Clay Co.
		NY377	GU207225	R.C. Harris 52660	U.S.A., Ohio, Gallia Co.
		NY378	GU207226	J.C. Lendemer 13503	U.S.A., Pennsylvania, Wyoming Co,
		NY379	GU207227	R.C. Harris 54374	U.S.A., Vermont, Essex Co.
C. caespiticia		NY228	GU207228	J.C. Lendemer 15185	U.S.A., New Jersey, Cape May Co.
		NY368	GU207229	J.C. Lendemer 13221	U.S.A., Pennsylvania, Lackawanna Co.
		NY96	GU207230	J.C. Lendemer 12579	U.S.A., Pennsylvania, Carbon Co.
C. petrophila	fumar-	NY358	GU207231	J.C. Lendemer 8208a	U.S.A., North Carolina, Haywood Co.
	fumar+	NY366	GU207232	R.C. Harris 51547	U.S.A., Connecticut, Fairfield Co.
	fumar+	NY369	GU207233	J.C. Lendemer 12975	U.S.A., Pennsylvania, Pike Co.
	fumar-	NY37	GU207234	J.C. Lendemer 8208b	U.S.A., North Carolina, Haywood Co.
	fumar+	NY370	GU207235	J.C. Lendemer 12145	U.S.A., Pennsylvania, Pike Co.
	fumar+	NY371	GU207236	R.C. Harris 52527	U.S.A., Pennsylvania, Huntingdon Co.
	fumar+	NY372	GU207237	J.C. Lendemer 11858	U.S.A., Pennsylvania, Blair Co.
	fumar+	NY38	GU207238	J.C. Lendemer 7371	U.S.A., Ohio, Gallia Co.
	fumar-	NY404	GU207239	J.C. Lendemer 10973	U.S.A., Georgia, Towns Co.
	fumar-	NY405	GU207240	J.C. Lendemer 4690	U.S.A., North Carolina, Transylvania Co.
	fumar+	NY406	GU207241	J.C. Lendemer 10867	U.S.A., North Carolina, Clay Co.
	fumar-	NY407	GU207242	J.C. Lendemer 8208c	U.S.A., North Carolina, Haywood Co.
C. stipitata		NY360	GU207243	J.C. Lendemer 4856	U.S.A., North Carolina, Transylvania Co.
		NY400	GU207244	J.C. Lendemer 7615a	U.S.A., North Carolina, Transylvania Co.
		NY401	GU207245	J.C. Lendemer 7615b	U.S.A., North Carolina, Transylvania Co.
		NY402	GU207246	J.C. Lendemer 6905	U.S.A., North Carolina, Jackson Co.
		NY403	GU207247	J.C. Lendemer 8994	U.S.A., Georgia, Rockdale Co.

Opuscula Philolichenum, **7**: 101-120. 2009.

Lichens and Related Fungi of Pine Bluff Arsenal, Arkansas

Douglas Ladd[1]

ABSTRACT. – A total of 161 taxa of lichens and related fungi were documented from Pine Bluff Arsenal in Jefferson County, on the Gulf Coastal Plain in south-central Arkansas. Constrained time entitations in five natural area units within the arsenal revealed a high degree of similarity among the lichen biota of the units. Crustose lichens are the most common growth form, comprising nearly 60% of the lichen diversity at the site. The lichen biota of the Pine Bluff Arsenal has strong biogeographic affinities to the southeastern coastal plain, including western range extensions for several coastal plain species.

Introduction

Pine Bluff Arsenal encompasses 14,944 acres (5,978 ha) along the west side of the Arkansas River in Jefferson County, south-central Arkansas, north of the town of Pine Bluff. Established in 1941, the facility has provided various manufacturing, storage and dismantling functions for specialty munitions and chemical weapons. Most of the site lies within the West Gulf Coastal Plain ecoregion, although some of the low wetlands and riparian areas fall within the Mississippi River Alluvial Plain ecoregion (TNC 1999). The site consists of a mix of flat lowlands and moderately dissected low rolling uplands, with a total elevational relief of 145 feet. Some steep soil banks with generally eastern exposure occur along the Arkansas River and Yellow Lake. Detailed descriptions of the site, its physical features, and vascular vegetation are provided by Campbell et al. (1997).

Despite a long history of disturbance associated with military use, more than 10,000 acres (4046 ha) of the tract is forested. These woodlands range from hardwood and pine-hardwood stands in the uplands to bottomland hardwoods in the poorly drained sites, and a few wetlands with old growth Bald Cypress (*Taxodium distichum*). Dominant trees in the uplands include Loblolly Pine (*Pinus taeda*), Shortleaf Pine (*Pinus echinata*), White Oak (*Quercus alba*), Post Oak (*Q. stellata*), and Southern Red Oak (*Q. falcata*). In addition to Bald Cypress, trees of more mesic and wet sites include Sweetgum (*Liquidambar styraciflua*), Water Oak (*Quercus nigra*), Willow Oak (*Q. phellos*), Green Ash (*Fraxinus pennsylvanica*), Beech (*Fagus grandifolia*), Sugarberry (*Celtis laevigata*), Box Elder (*Acer negundo*), Hornbeam (*Carpinus caroliniana*), and Bitternut Hickory (*Carya cordiformis*).

Methods

Most field work for this project was conducted in December 1999 (Ladd 2000). Attempts were made to survey all habitats and substrates throughout non-restricted portions of the Pine Bluff Arsenal. To assess the equability of lichen distribution within the arsenal property, and to ensure the completeness of the survey, detailed lichen inventories were compiled for five natural area units within the site, spending approximately equal area-corrected survey time in each unit (minimum 0.5 person days/unit). Four of these units, the Phillips Creek, Refuge Woods, Tripletts Bluff, and Yellow Lake units, are the same as those described in Campbell et al. (1997). The Eastwood Bayou unit is immediately east of the unit described in Campbell et al. (1997).

Attempts were made to investigate all habitat types and substrates within each unit. All lichens observed in each unit were recorded, along with substrate information and qualitative observations of abundance. A lower intensity of survey effort was also directed to areas outside of the natural area units, in an attempt to assess as many potential habitats, substrates, and landscape conditions as possible.

Where appropriate, acetone extracts of lichens were chromatographed on Whatman K6 60Å 250µm silica gel coated 10 H 20 cm glass plates using the three solvent system of Culberson and Kristinsson (1970), with the methyl tert-butyl ether substitution modification in solvent B (Culberson & Johnson 1982).

[1]Douglas Ladd – The Nature Conservancy, 2800 S. Brentwood Blvd., St. Louis, MO, 63144, USA. – e-mail: dladd@tnc.org

Results and discussion

I. – Diversity

A total of 161 taxa of lichens and related fungi, including some unnamed species, have been documented from Pine Bluff Arsenal. This level of lichen diversity is less than would be expected for an equivalent area in the Ozark region, which is one of the few areas in midcontinental North America for which within-site lichen diversity is available. Lichen diversity at the arsenal is likely constrained by both the lack of saxicolous substrates and the long history of intensive land use, including farming prior to establishment of the arsenal. For comparison, Ladd (1996) documented 201 lichens from two forest units totaling 1,231 acres (492 ha) in the northern portion of the Missouri Ozarks, although 62 (31%) of these taxa were obligately saxicolous. Wetmore (1992) reported 179 lichens from Hercules Glades Wilderness, a 12,315 acre (4,926 ha) wilderness area in southwestern Missouri. Again, at least 37 (21%) of the taxa in Wetmore's report are obligately saxicolous. Thus the non-saxicolous diversity known from Hercules Glades Wilderness is lower than that for that of Pine Bluff Arsenal, an area of approximately similar size. Ladd and Grabner (1998) reported more than 250 lichens from the nine units of the Missouri Ozark Forest Ecosystem Project, encompassing some 9,400 acres (3,760 ha) in the southeastern Missouri Ozarks. All of these areas, however, have well-developed saxicolous substrates, greater microhabitat diversity, and a less intensive and environmentally severe land use history. Thus, given the paucity of saxicolous substrates and the past disturbance history of the area, the presence of 161 taxa of lichens at Pine Bluff Arsenal is significant, and represents a diverse cohort of lichens.

As shown in Table 1 (below), coefficients of similarity reveal that the lichen biota among the five natural area units is compellingly similar. Even more compelling is the uniform variance displayed by the narrow range of similarity coefficients among the lichens of any pair of units, ranging only from 0.67 to 0.73. Forty-seven (30%) of the lichens are common to all five units, and an additional 21 (14%) are known from four units.

Site (lichen taxa)	**YL**	**TB**	**RW**	**PC**
Eastwood **B**ayou (76)	.68	.73	.69	.73
Phillips **C**reek (92)	.70	.73	.67	
Refuge **W**oods (95)	.69	.68		
Tripletts **B**luff (92)	.70			
Yellow **L**ake (102)				

Table 1. Coefficients of similarity among the lichen biota of natural area units within Pine Bluff Arsenal.

With the exception of the Eastwood Bayou unit, the lichen biota of each of the survey units has a similar level of diversity of about 100 lichen taxa. The significantly lower diversity of the Eastwood Bayou unit probably results from a combination of less survey time and more anthropogenically disrupted habitat, including large areas of former farmland.

Forty-one (26%) of the lichens are known only from a single unit. Most of these are uncommon lichens of minor importance from a dominance or cover perspective. Fourteen of these are known only from the Refuge Woods unit, eleven are known only from the Yellow Lake unit, nine are known only from the Tripletts Bluff unit, and seven occur only within the Phillips Creek unit. There were no lichens unique to the Eastwood Bayou unit.

II. – Physiognomy

A majority of the lichens of Pine Bluff Arsenal are crustose (Table 2, below). This parallels physiognomic profiles from elsewhere in North America: Ladd (1996) reported a similar distribution of physiognomic types from woodlands in the northern Ozarks of Missouri, with 65% of the lichens crustose, 25% foliose, and 9% fruticose. A study of the lichens of a small preserve in southwestern Connecticut (Ladd et al. 2009) was also similar in pattern of lichen physiognomy: 59% crustose, 26% foliose, 15% fruticose. It is interesting to speculate whether this ratio among physiognomic classes prevails throughout intact habitats in eastern and central North America. The low diversity of

gelatinous lichens at Pine Bluff is likely due to past land use history and the sensitivity of many gelatinous lichens to both habitat perturbation and air pollution. The former clearing of much of the Pine Bluff site, and the presence of a large pulp mill immediately to the south, have both undoubtedly impacted the local biota, including the lichens.

Physiognomy	# of taxa	% of flora
Crustose	96	59.6
Foliose	45	28.0
Fruticose	20	12.4

Table 2. Physiognomic profile of the lichens of Pine Bluff Arsenal

III. – Substrates and Habitats

At Pine Bluff Arsenal, primary substrates available to lichens are trees and, to a lesser extent, soil, and lignin. There are extremely limited occurrences of saxicolous substrates associated with poorly consolidated sand and siltstones in soil exposures, as well as some weathered old concrete bridges and culverts. Bryophytes are locally abundant, but muscicolous lichens are rare at the site.

Lichens are widely distributed on almost every available substrate throughout all portions of the arsenal that were surveyed, except for mowed open lawn expanses and high usage areas surrounding buildings and other facilities. In some of the more heavily overgrown or younger secondary timbers, lichens were not as abundant as in more mature and open woodlands, but all woodlands had a pervasive lichen presence.

Corticolous lichens dominated the site diversity, with 126 lichens (87% of the biota). Fifteen lichens (10% of the biota) occurred on lignin, which consisted primarily of decorticate stumps and logs of oaks and pines. Twelve lichen taxa (8% of the biota) were terricolous; these occurred primarily on exposed to lightly shaded, stable, well-drained soil embankments above flood levels along streams and in association with established cultural features such as ditches and dikes. Despite the near absence of saxicolous substrates, eight taxa (5% of the biota) inhabited the sparse, small sedimentary fragments found in a few soil embankments, and on weathered concrete of bridges, culverts, and abutments. One species, *Phaeocalicium polyporaeum*, is restricted to thalli of Turkeytail Fungus (*Trichaptum biforme*).

Of the corticolous lichens known from Pine Bluff Arsenal, two thirds (90) are restricted to hardwoods, while about 16% (22) are restricted to conifers. The remaining 18% (24) of the corticolous lichens are facultative, occurring on both hardwoods and conifers. Woodland lichen association patterns can be broadly grouped into upland and lowland types. The annotated list of lichens discusses in detail the substrate and habitat affinities of each lichen documented from the site.

Distinct associations of lichens are correlated with substrate, habitat, and, for corticolous lichens, position on the tree. On hardwoods, young upper branches and small shrubs and trees in old fields are characterized by a cohort of largely crustose pioneer lichens such as *Arthonia quintaria, Buellia stillingiana, Lecanora strobilina, Pertusaria pustulata, Physcia pumilior, Physcia stellaris,* and *Pyrrhospora varians*. In established woodlands, mid-boles and large branches of canopy trees in relatively high light intensities are typically inhabited by *Buellia stillingiana, Caloplaca cerina, Candelaria fibrosa, Hypotrachyna livida, Maronea polyphaea, Myelochroa galbina, Parmotrema austrosinense, P. hypotropum, P. perforatum.* and *Pertusaria texana*.

In more shaded, but not deeply overgrown, sites the mid-bole lichen association is dominated by foliose taxa, including *Parmotrema subtinctorium, Physcia americana, Punctelia rudecta,* and *Pyxine subcinerea*; *Bacidia schweinitzii, Pertusaria ostiolata* and *P. paratuberculifera* are also common here. Most of the gelatinous lichens present at the arsenal are restricted to the tree bases. Typical among the mostly foliose lichens characteristic of tree bases are *Collema furfuraceum, Leptogium austroamericanum, L. cyanescens, Myelochroa aurulenta, Parmotrema reticulatum,* and *Phaeophyscia rubropulchra*.

Pine boles are characterized by a more homogeneous lichen composition, with most or all of the lichen biomass typically restricted to the lower portions of the bole. Characteristic lichens on pines include *Canoparmelia caroliniana, Cladonia macilenta* var. *bacillaris, Coenogonium luteum, Parmotrema hypotropum, Punctelia rudecta,* and *Trapeliopsis flexuosa*. *Cladonia macilenta* var. *bacillaris* often forms extensive patches near the bases of pines in established uplands that have not become overgrown in the shrub and ground cover layers. *Hypotrachyna pustulifera* occurs principally on

exposed to lightly shaded, older pines in remnant natural areas. *Chaenothecopsis nana* is a common and characteristic associate on Shortleaf Pines throughout the site, but was never observed on Loblolly Pines, which are the more common pine at the arsenal. Scales of old pine cones are inhabited by *Amandinea punctata, Lecanora strobilina*, and *Pyrrhospora varians*.

One of the most interesting substrates was Bald Cypress, which supported a number of unique species for the arsenal, including several lichens of potential conservation concern. Portions of the boles of cypress and other trees subject to flooding typically have no lichens, but above maximum flood levels, Bald Cypress is characterized by a number of lichens such as *Buellia elizae, Chrysothrix xanthina, Hypotrachyna pustulifera, Lepraria friabilis*, *Loxospora pustulata,* and *Parmelinopsis minarum*.

Ligneous substrates at the arsenal consist primarily of fallen logs, and are characterized by lichens such as *Flavoparmelia caperata, Parmotrema reticulatum, Placynthiella icmalea, Punctelia rudecta, Trapeliopsis flexuosa,* and several species of *Cladonia*, particularly *C. macilenta* var. *bacillaris* and *C. peziziformis*. Vertical decorticate snags are often devoid of lichens, but sometimes are inhabited by *Mycocalicium subtile* and *Lecanora strobilina*.

Terricolous lichens are restricted to stable, well-drained soil embankments where competition from vascular vegetation is minimal, such as along higher streambanks and the heads of the steeper slopes along the west side of Yellow Lake and along the Arkansas River. These habitats are characterized by *Cladonia* species such as *C. caespiticia, C. grayi, C. peziziformis*, and, in higher light intensities, *C. piedmontensis* and *C. polycarpoides*. Deeply shaded soil banks, such as under sheltered overhangs along streams, are sometimes inhabited by *Lepraria lobificans*, which appears to be the most shade tolerant lichen at the site.

A distinct but low diversity cohort of lichens inhabits weathered old concrete. The two typical taxa in this habitat are *Caloplaca feracissima* and *Lecanora dispersa*; *Caloplaca subsoluta, Candelaria concolor, Phaeophyscia pusilloides,* and *Sarcogyne regularis* are less common lichens on concrete at the site. Obligate calciphiles such as the *Caloplaca, Lecanora*, and *Sarcogyne* species are undoubtedly post-settlement introductions to the site, since their calcareous substrates are recent artifacts.

IV. – Biogeographic Affinities

The lichen biota of the site is comprised largely of wide-ranging taxa with pan-temperate and east temperate affinities in North America: 79 taxa (54%) are east-temperate and 44 (30%) are pan-temperate. There is a strong influence of coastal plain and southeastern biogeographic relationships: 20 taxa (14%) display a southeastern coastal plain pattern, and an additional 12% of the wide-ranging taxa have predominately southeastern biogeographic affinities. This previously unreported strong affinity with the southeastern coastal plain near the western edge of the Gulf coastal plain is reinforced by the presence of a number of rare or unusual taxa previously known mostly or wholly from the Gulf or Atlantic coastal plains, such as *Amandinea leucomela, Buellia elizae, B. wheeleri, Monoblastia rappii, Opegrapha* sp. 82, *Phaeographina explicans, Pyrenula citriformis, Ramonia microspora*, and *Strigula viridiseda*. There is also a complete absence of lichens with biogeographic affinities restricted to northeastern or northern North America.

V. – Lichens of Potential Conservation Concern

Several lichens at the arsenal are of potential conservation concern from both global and ecoregional or state perspectives. Some of these are significant range extensions or represent populations of widely distributed lichens known from only a few sites globally. Because of the extremely limited lichen field data from many areas of North America, it is often difficult to determine the rarity of a given species or the significance of an apparent range extension or disjunction. As discussed in more detail in the appropriate entries in the annotated list, lichen taxa of potential conservation significance at Pine Bluff arsenal include *Amandinea leucomela*, *Buellia elizae, Buellia wheeleri, Chaenotheca hygrophila*, *Eopyrenula intermedia*, *Monoblastia rappii, Opegrapha* sp. 82, *Phaeographina explicans*, *Ramonia microspora, Schismatomma glaucescens*, and *Strigula viridiseda.*

Annotated List of Lichens of the Pine Bluff Arsenal

Table 3 (below) enumerates all of the lichens currently documented from Pine Bluff Arsenal. It is arranged alphabetically by genus and species, generally following the nomenclatural concepts of Esslinger (2009). For each lichen, a description of habitat, substrate, and abundance at Pine Bluff Arsenal is provided. These data apply only to the arsenal site, and some lichens may have different predilections elsewhere in their range. In some cases, particularly for unnamed taxa, brief synopses of salient morphological features are provided.

The author's collection numbers for voucher specimens are provided within brackets following each species entry. Vouchers are deposited at NY unless rendered in italics, which are in the author's herbarium for eventual deposition at NY. Based on its North American distribution, each lichen taxon is assigned a biogeographic pattern generally following the patterns of Brodo et al. (2001). These are indicated by letter codes at the end of each entry in the list: ET – eastern temperate, PT – pan-temperate, CP – coastal plain, MW – Midwest and Great Plains, UNK - unknown. An 'S' in parentheses after a letter code indicates a predominately southern distribution within that pattern type. Columns following the species entry represent each of the five natural area units described in detail in Campbell et al. (1997), with X's indicating lichen occurrence within each unit. Note that some lichens are known from Pine Bluff Arsenal but are not documented from any of the natural area units; these taxa appear in the table, but with no X's in any of the columns.

In addition to the lichens present at Pine Bluff Arsenal, it is interesting to note the absence of a number of lichens that would be predicted to be common at the site, based on their autecology and distribution in the lower Midwest. While some of these taxa may eventually be documented from the arsenal, none are common or it is likely that they would have been recorded during this project. These taxa include *Anisomeridium polypori, Heterodermia granulifera, H. hypoleuca, Hyperphyscia adglutinata, Lecanora thysanophora, Pannaria lurida, Parmotrema despectum, P. tinctorum, Pertusaria trachythallina, Phaeophyscia ciliata, P. hirsuta, Physconia leucoleiptes, Placidium arboreum* and *Tuckermannopsis fendleri*. Despite the presence of Beech trees, and its occurrence elsewhere in Arkansas, *Trypethelium virens* is not known from the arsenal.

TABLE 3. Lichens of Pine Bluff Arsenal.

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	**P**	**R**	**T**	**Y**
***Abrothallus cladoniae* R. Sant. & D. Hawksw.** Known from a collection on apothecia of *Cladonia caespiticia*; cited by Diederich (2003). [22088] UNK					
***Amandinea leucomela* (Imshaug) P. May & Sheard** Uncommon on shaded boles of Bald Cypress in mature stands. According to Sheard & May (1997), this lichen is known only from coastal Louisiana, Florida, and Georgia. The Pine Bluff population is the northwesternmost known occurrence of the species, and represents a significant range extension [22083] CP		X		X	
***Amandinea polyspora* (Willey) E. Lay & P. May** Occasional on exposed to lightly shaded young twigs, especially in young stands and thickets. [21803, 21994] ET		X	X	X	X
***Amandinea punctata* (Hoffm.) Coppins & Scheid.** Occasional; occurring on a variety of substrates in Arkansas, but at Pine Bluff Arsenal known only from bark and cones of pines, especially along exposed edges of stands. [22108] PT				X	
***Arthonia caesia* (Flot.) Körb.** Common on exposed small twigs in all habitats, including small shrubs in weedy areas. [21868, 21952] ET	X		X	X	X
***Arthonia quintaria* Nyl.** Frequent on young, smooth-barked hardwood twigs in open or slightly shaded conditions. [21802, 21917] PT	X	X	X	X	X
***Arthonia rubella* (Fée) Nyl.** Common on mid and upper boles of a wide variety of hardwoods in mature stands. [21906, 22107, *22130*] CP?	X	X	X	X	X
***Arthothelium taediosum* auct. Amer.** Apparently rare; known only from a lightly shaded hickory sapling in a wooded upland. In the Ozarks to the north, this is a common and characteristic species of mature hardwood stands, usually occurring on upper boles and larger branches. [21848] ET				X	
***Bacidia circumspecta* (Nyl. ex Vain.) Malme** Occasional on shaded lower boles of hardwoods in moist to mesic woodlands, typically on species with more neutral bark pH,		X			X

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	P	R	T	Y
such as ash and Box Elder; local populations have pale brown apothecia with tinges of smoky black. [21912, 22100] PT					
***Bacidia diffracta* Ekman** Occasional on shaded hardwood boles, usually in mesic to wet woodlands. [21944, 21960] PT					X
***Bacidia polychroa* (Th. Fr.) Körb.** Frequent on hardwoods in mesic to wet sites, and occasionally in drier woodlands. [21894, 22098] ET	X	X			X
***Bacidia schweinitzii* (Fr. ex E. Mich.) A. Schneid.** Common on shaded hardwood boles in all woodland types, especially in floodplains and bottomlands. [21790, 22073] ET	X	X	X	X	X
***Bacidia suffusa* (Fr.) A. Schneid.** Less common than other *Bacidia* species; on hardwoods, typically Green Ash, in bottomland stands and along shaded streams. [21910] ET					X
***Bacidina* cf *varia* Ekman** Known only from a small Redbud (*Cercis canadensis*) sapling along Phillips Creek; characterized by a thin greenish thallus with small pale apothecia and notably thin-walled, narrow ascospores typically 35 x <3 µm. Ekman (1996) lists the North American range of this species as Florida and southeastern Louisiana, so this population represents a significant range extension. [22062] CP		X			
***Buellia curtisii* (Tuck.) Imshaug** [*Baculifera curtisii* (Tuck.) Marbach] Apparently uncommon; on branches and upper boles of hardwoods. In the field, this species is not clearly distinct from the common *B. stillingiana*, and consequently may be overlooked. [*21869,* 21913] PT				X	X
***Buellia dakotensis* (H. Magn.) Bungartz [=*Amandinea dakotensis* (H. Magn.) P. May & Sheard]** Uncommon on small, lightly shaded branches of Bald Cypress and hardwoods; usually in the canopy. [21977] MW					X
***Buellia elizae* (Tuck.) Tuck.** [=*Gassicurtia elizae* (Tuck.) Marbach] Uncommon and restricted to lower boles of old growth Bald Cypress. Little is known about the distribution of this lichen, which appears to be restricted to conifers. A type specimen from Virginia was deposited at F (Hodkinson et al. 2009), and the lichen collection at NY contains specimens from Alabama, Florida, Georgia, Massachusetts, and North and South Carolina. The Pine Bluff material represents a significant western range extension for the species. [*21854*] ET				X	
***Buellia erubescens* Arnold. [=*Buellia stillingiana* J. Steiner]** Common on branches of canopy hardwoods, and occasional on lightly shaded mid and upper boles in mature stands. [21837, 21933, 21979] PT	X	X	X	X	X
***Buellia wheeleri* R. C. Harris [=*Ciposia wheeleri* (R.C. Harris) Marbach]** Known from lightly shaded boles of Bald Cypress in the Yellow Lake unit. This lichen is known from a few scattered locations on the coastal plain, mostly in Florida (Harris 1988, Lendemer & Hodkinson 2009a). The Pine Bluff specimen is a significant western range extension from the other records. [21972] CP					X
***Bulbothrix goebelii* (Zenker) Hale** Known only from Red Maple in a swampy woodland. [21771] CP					
***Calicium salicinum* Pers.** Known from the shaded lower bole of an immense Sweetgum in a low woodland. [*21885*] PT				X	

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	P	R	T	Y
***Caloplaca camptidia* (Tuck.) Zahlbr.** Occasional on hardwoods in established stands, typically occurring above mid-bole. This species occurs as scattered thalli, and is never abundant. [21892, 21982, 22003, 22059] ET(S)	X	X	X	X	X
***Caloplaca cerina* (Ehrh. ex Harm.) Th. Fr.** Frequent on lightly shaded, often small diameter, hardwood substrates, both on canopy branches and upper boles in established woodlands, and younger boles in successional stands. [21914] PT		X	X		X
***Caloplaca chrysophthalma* Degel.** Rare; known only from branches of lightly shaded hardwoods in seasonally saturated flats, although elsewhere in its range this is predominately an upland species. [21793] PT			X		X
***Caloplaca feracissima* H. Magn.** Common on exposures of old, weathered concrete. [*21927*] ET		X		X	
***Caloplaca flavorubescens* (Hudson) J. R. Laundon** Known only from a small thallus fragment on the upper bole of a fallen Cottonwood in an open swampy habitat bordering Yellow Lake. [21898] PT					X
***Caloplaca microphyllina* (Tuck.) Hasse** Collected once on the upper canopy branches of a large Water Oak, but possibly more common in inaccessible canopy trees. [*22002*] PT			X		
***Caloplaca subsoluta* (Nyl.) Zahlbr.** Occasional on exposures of old, weathered concrete. [*21925*] PT					
***Candelaria concolor* (Dicks.) Stein.** Common, but never dominant, on boles of woodland trees, and sometimes on brush and young hardwoods in weedy situations; rarely on shaded old concrete. [21788] PT	X	X	X	X	X
***Candelaria fibrosa* (Fr.) Müll. Arg.** Occasional on upper branches of hardwoods in mature stands; in dry, mesic, and wetland sites. [21920] ET	X	X	X	X	X
***Candelariella reflexa* auct. Amer.** Occasional on exposed to lightly shaded hardwood substrates, typically on larger canopy branches and upper boles, but occasionally on older twigs of brush in thickets. Note that Westburg et al. (2007) indicate that true *C. reflexa* probably does not occur in North America. The name as applied here refers to an 8-spored taxon that is morphologically analogous to *C. efflorescens* R.C. Harris & W.R. Buck. [21941, 22020] PT?		X	X	X	X
***Candelariella* sp.** Known only from the upper branches of a fallen Southern Red Oak in an extensive woodland. This species has a thallus consisting of a compact mass of minutely effigurate areoles, each to 0.4 mm broad, with a few scattered apothecia; the asci are consistently 8-spored. Although the 8-spored *C. aurella* (Hoffm.) Zahlbr. can rarely be corticolous, the Pine Bluff Arsenal specimen has thinner paraphyses, smaller ascospores, and a much more well-developed thallus. [22017] CP?			X		
***Canoparmelia caroliniana* (Nyl.) Elix & Hale** Common on shaded lower boles and bases of Bald Cypress and Loblolly and Shortleaf pines; extremely rare on shaded hardwood boles in mixed stands. [21772, 21821, 21851, 22036, 22038, 22128] ET(S)	X	X	X	X	X
***Canoparmelia crozalsiana* (de Lesd. ex Harm.) Elix & Hale** Uncommon but widely distributed on hardwoods, occurring from bases to canopy branches. [21865, 21991, *22048*] PT(S)		X	X	X	X

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	P	R	T	Y
***Canoparmelia texana* (Tuck.) Elix & Hale** Known only from a single record on dead oak branches in a secondary woodland. [21954] ET(S)					X
***Chaenotheca hygrophila* Tibell** Rare; in sheltered crevices on deeply shaded lower boles of large old growth Bald Cypress in the Tripletts Bluff unit. This is potentially one of the most stable and least impacted habitats at the site, and should be a conservation priority. [21886] ET				X	
***Chaenothecopsis nana* Tibell** Occasional on lightly shaded boles of Shortleaf Pine. It is interesting that this lichen was not observed on Loblolly Pine, which is more abundant at the site. [21817] ET(S)	X	X		X	X
***Chrysothrix xanthina* (Vain.) Kalb** Frequent on lower boles of pines, Bald Cypress, and hardwoods, typically growing on areas sheltered from runoff or prolonged wetting. [21777, 21871, 22039] PT	X	X	X	X	X
***Cladonia apodocarpa* Robbins** Apparently uncommon; on exposed, stable, xeric soil banks and faces. This species resembles the more common *C. polycarpoides*, but can be confused with a number of other apodetiate and/or frequently-sterile *Cladonia* species (see Lendemer & Hodkinson 2009b). [21818] ET				X	
***Cladonia caespiticia* (Pers.) Flörke** Occasional on lightly shaded, well-drained mossy soil embankments, typically associated with *C. grayi* and other *Cladonia* species. [21877, 21878, 21965, *22085*]		X		X	X
***Cladonia coniocraea* (Flörke) Spreng.** Rare; on shaded decorticate log of Loblolly Pine. [21786] PT					
***Cladonia cristatella* Tuck.** Very uncommon; despite ample suitable habitat at Pine Bluff Arsenal and the near ubiquity of this lichen elsewhere in the region, known only from a small area of exposed eroded banks of sandy soil on the escarpment west of Yellow Lake. Within this area, it is common on exposed stabilized soil and rotting logs. [21955] ET					X
***Cladonia cylindrica* (A. Evans) A. Evans** Rare; on mossy, well-drained soil and mossy tree bases. [21853] ET		X		X	
***Cladonia didyma* (Fée) Vain.** Known only from the shaded base of a Loblolly Pine in an open woodland. These pine bases are typically frequented by *C. macilenta* var. *bacillaris*, which from a distance appears quite similar, so *C. didyma* may be overlooked and more common than indicated. [*22093*] ET		X			
***Cladonia grayi* G. Merr. ex Sandst.** Locally common on exposed well-drained soil, typically associated with other species of *Cladonia*; occasionally on decorticate logs. Most material in the study area contains grayanic and fumarprotocetraric acids, although populations with grayanic acid only also occur at the site. [grayanic and funarprotocetraric acids: 21826, 21891, 22086; grayanic acid only: 21967] PT		X		X	X
Cladonia macilenta* Hoffm. var. *macilenta Known only from a shaded, old weathered decorticate pine fencepost on the wooded escarpment bordering Yellow Lake. [*21968*] PT					X
***Cladonia macilenta* Hoffm. var. *bacillaris* (Genth) Schaer.** Abundant on bases and lower boles of lightly shaded pines, and occasional on rotting logs of pines and	X	X	X	X	X

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	P	R	T	Y
hardwoods. [21834, 21876, 21951, 21963, 22066] PT					
***Cladonia ochrochlora* Flörke** Uncommon on shaded lower boles and decorticate logs of Loblolly Pine; also to be expected on hardwood logs. [21804] PT			X		
***Cladonia peziziformis* (With.) J. R. Laundon** Common; on well-drained stable soil with minimal competition from vascular plants, corticate and decorticate rotting logs, and shaded bases of both pines and more commonly hardwoods. This is the most disturbance-tolerant *Cladonia* at the site. [21836, 21983, 21985] ET	X	X	X	X	X
***Cladonia piedmontensis* G. Merr.** Locally frequent in open, stable exposures of sandy soils, typically at the heads of embankments and stream cuts. [21811, 21813, 21814, 21889, 21890, 21961, 21964] ET			X	X	X
***Cladonia pleurota* (Flörke) Schaer.** Known only from the head of a massive vertical soil embankment in open woodland along Phillips Creek, associated with *C. grayi* and *C. polycarpoides*. [22087] PT		X			
***Cladonia ramulosa* (With.) J. R. Laundon** Occasional on bases of Bald Cypress and Loblolly and Shortleaf pines in woodlands, as well as on fallen pine logs. [*22025*, 22091, 22119] ET	X	X	X	X	X
***Cladonia subcariosa* Nyl.** [=*C. polycarpoides* Nyl. in Zwackh] Locally common in open, stable exposures of sandy soil in areas with minimal competition from vascular plants; often associated with *C. piedmontensis*. Local populations all contain norstictic acid. [21810, 21812, 21887, 21962, 21966, 22089, 22090] ET		X	X	X	X
***Cladonia subtenuis* (Abbayes) Mattick** Rare; known only from a single small zone of exposed sandy soil at the edge of the escarpment above Yellow Lake. This lichen requires exposed, well-drained acidic substrates, and there is little suitable habitat in the current overgrown woodlands at the site. [21958] ET					X
***Coccocarpia palmicola* (Spreng.) Arv. & D. J. Galloway** Infrequent on shaded hardwood bases in mature woodlands. [21839, 22132] ET	X			X	
***Coenogonium luteum* (Dicks.) Kalb. & Lücking** [=*Dimerella lutea* (Dicks.) Trevis.] Occasional on shaded mid-boles of Bald Cypress and Loblolly Pine. [*21089*, 22027] PT	X		X	X	
***Coenogonium pineti* (Ach.) Lücking & Lumbsch** [=*Dimerella pineti* (Ach.) Vězda] Uncommon on mossy tree bases and shaded lower boles of pines and hardwoods. [22013] ET			X	X	
***Coenogonium* sp.** [=*Dimerella* sp.] Known only from the shaded lower bole of a large Bald Cypress in a low woodland along Phillips Creek. This lichen is characterized by a sublustrous, thin, continuous, greenish white thallus with abundant orange apothecia to 0.4 mm diameter with thickish paler margins; hymenium IKI+ blue; ascospores ultimately one septate and ca. 11.5 □ 3.1 µm. This specimen is close to *C. pineti*, but appears sufficiently different to warrant segregation. With only two valid names available in North America the former *Dimerella* remains a problem and badly in need of revision. [*22084*] CP?		X			
***Collema conglomeratum* Hoffm.** Uncommon on exposed or lightly shaded hardwood boles, typically White Oak, Sweet Gum, and White Ash, in wooded uplands. [21936, 22125] PT	X	X			

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	**P**	**R**	**T**	**Y**
***Collema subflaccidum* Degel.** Occasional on lightly shaded hardwood boles in established stands, typically in uplands. This lichen usually occurs near the base of the tree. [21942] PT	X	X	X	X	X
***cf Conotrema urceolatum* (Ach.) Tuck.?** What may be immature or poorly developed specimens of this lichen occurs on a large canopy Water Oak; the thallus is the characteristic whitish crust with abundant *Trebouxia*, and the apothecia, although small, have the characteristic deep pits that appear almost perithecioid; ascospores are not present. [*22007, 22011*] ET			X		
***Cornutispora lichenicola* D. Hawksw. & B. Sutton** This lichenicolous fungus occurred on *Ochrolechia africana* in the Tripletts Bluff unit, as cited by Diederich (2003). [21833] UNK					
***Dendriscocaulon intricatulum* (Nyl.) Henssen** Rare on shaded bases of hardwoods in mesic sites, typically associated with other cyanolichens such as *Collema* and *Leptogium*. [22127] UNK	X	X			
***Dirinaria confusa* D. D. Awasthi** Rare on hardwoods in open areas such as mowed parklands and landscaped residential areas; not yet known from any of the natural area units. [*22051*] CP					
***Eopyrenula intermedia* Coppins** Known only from the bole of a fallen Box Elder in a wet woodland. This is one of very few lichens with boreal/north temperate affinities that occur at Pine Bluff Arsenal. It is typically a species of the Great Lakes region (Harris 1973), and while its range has been found to extend southward along the Appalachain Mountains (Hodkinson et al. 2009, Hodkinson 2010) and into the Ozarks (Harris & Ladd 2005), this record is the first from southern coastal plain lowlands. [*21895*] PT					X
***Flavoparmelia caperata* (L.) Hale** Frequent on shaded bases and lower boles of hardwoods in established stands, and less commonly on upper boles, larger canopy branches, and rotting logs, as well as bases of pines. [21827] PT	X	X	X	X	X
***Graphis scripta* (L.) Ach.** Common on a variety of hardwoods, especially smooth, hard-barked trees such as Beech and Hornbeam. [21798, 21838, 22061] PT	X	X	X	X	X
***Gyalideopsis buckii* Lücking, Sérus. & Vězda** Known only from a single location, on young branches of a small plum sapling in a streamside thicket. [*21996*] ET(S)			X		
***Heterodermia albicans* (Pers.) Swinscow & Krog** Common on bases and lower boles of hardwoods and occasionally pines, particularly characteristic on Water Oak and Willow Oak. [21778, 21883, 21992, 21896A, 22015A, *22047*] ET(S)	X	X	X	X	X
***Heterodermia obscurata* (Nyl.) Trevis.** Occasional but never abundant, usually on lower and mid boles of hardwoods in mature stands. [21970] ET	X				X
***Hyperphyscia syncolla* (Tuck. ex Nyl.) Kalb** Frequent on shaded branches and boles of hardwoods in woodlands and thickets, usually in wet sites but occasionally in uplands. [21969] ET	X	X	X		X
***Hypotrachyna livida* (Taylor) Hale** Occasional on lightly shaded upper boles and larger canopy branches of hardwoods, especially oaks, in mature woodlands; rarely on pine boles. [21832, 21901]ET	X	X	X	X	X
***Hypotrachyna pustulifera* (Hale) Skorepa** Occasional and sometimes locally abundant	X	X	X	X	X

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	P	R	T	Y
on mid and upper boles of conifers, including Loblolly and Shortleaf pines and Bald Cypress; rarely on lightly shaded boles of Southern Red Oak. [21845, 22028, 22034] CP					
***Lecanora chlarotera* Nyl.** Occasional on shaded, smooth-barked hardwood boles in mesic and wet woodlands. [*21974*] ET		X			X
***Lecanora dispersa* (Pers.) Sommerf.** Uncommon on exposed, weathered concrete; *Caloplaca feracissima* is a consistent associate. Although known from Pine Bluff Arsenal, this lichen does not occur in any of the natural area units. [21928] PT					
***Lecanora hybocarpa* (Tuck.) Brodo** Frequent on lightly shaded hardwoods in mesic or drier conditions, ranging from lower boles to upper canopy branches. This species is also occasionally found on Bald Cypress. [21842, 21882,*21918, 21976,* 22045] ET	X	X	X	X	X
***Lecanora imshaugii* Brodo** Occasional on upper boles and larger canopy branches of hardwoods in established stands, usually in low habitats or in floodplains. [21856, *22008,* 22057] ET		X	X	X	X
***Lecanora strobilina* (Spreng.) Kieff.** Abundant and weedy, occurring on a variety of exposed to lightly shaded hardwood substrates, ranging from mature trees with areas of smooth bark, such as Black Cherry (*Prunus serotina*), to, more commonly, exposed younger twigs of trees and shrubs. In the latter habitat *Pyrrhospora varians* is a consistent associate. Also common on exposed pine bark and cones, and occasional on exposed decorticate wood, such as old fence posts. [21787, 21932] ET	X	X	X	X	X
***Lecanora subpallens* Zahlbr.** Frequent on lightly shaded mid to upper boles and larger canopy branches of hardwoods in mature stands; Water Oak and Willow Oak appear to be favored substrates. [21794, 22023, 22079] CP	X	X	X	X	X
***Lecanora* sp. #1** Uncommon on lightly shaded hardwoods, typically on young saplings or in the canopy of mature trees, on smooth-barked substrates. This species resembles *L. hybocarpa*, but contains atranorin and a terpene with R_f values slightly above those of zeorin; the hymenium has fine, non-crystalline inspersions, with large crystals in the amphithecium. [*21849, 22000*] UNK			X	X	
***Leiorreuma explicans* (Fink) Lendemer** [=*Phaeographina explicans* Fink] Known only from a small *Carya* sapling in a wooded upland above the Arkansas River. Apparently a lichen of southeastern affinities — the Pine Bluff population may be the northwesternmost known location. [*21850*] CP				X	
***Lepraria caesiella* R.C. Harris** Occasional on shaded lower boles of hardwoods in established woodlands. [22126] ET	X	X	X		X
***Lepraria friabilis* Lendemer, K. Knudsen & Elix** Occasional on mature Bald Cypress boles, in both exposed and shaded conditions. [21852, 22032] PT(S)		X	X	X	X
***Lepraria lobificans* Nyl.** Frequent in sheltered, deeply shaded sites, both on tree bases and protected bare soil embankments. [21807, 21884] PT	X	X	X	X	X
***Lepraria* sp. A** Known only from just above high water mark on lightly shaded Bald Cypress in a ponded depression. This species has a diffuse, bluish gray thallus and contains atranorin, fumarprotocetraric acid, and an unknown substance with an R_f value of ca. 5/5/6. It is close to *L. nivalis* J. R. Laundon, but may represent an undescribed taxon. [*22032*] UNK			X		

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	P	R	T	Y
***Lepraria* sp. B** Infrequent on shaded hardwood boles in mesic stands. This lichen has a diffuse, pale greenish gray leprose thallus that contains usnic acid and zeorin. [*22016*] UNK			X		
***Leptogium austroamericanum* (Malme) C. W. Dodge** Occasional on shaded bases and lower boles of hardwoods. [21844, 21937] ET(S)		X		X	
***Leptogium cyanescens* (Rabenh.) Körb.** Frequent on shaded bases and lower boles of hardwoods, and occasionally occurring higher along the bole. [21943] ET	X	X	X	X	X
***Leptogium milligranum* Sierk** Occasional on exposed to lightly shaded hardwood boles, typically on larger oaks and ashes, and usually associated with *Collema furfuraceum*. [21863, 21945] PT	X	X		X	X
***Loxospora pustulata* (Brodo & W. L. Culb.) R. C. Harris** Frequent on lightly shaded boles of hardwoods, Bald Cypress, and infrequently, on pines. [21859, 21872, 22035] ET	X	X	X	X	X
***Maronea polyphaea* H. Magn.** Frequent, but seldom abundant, on upper boles and canopy branches of hardwoods in established stands; rarely on lightly shaded small branches of hardwoods in old fields proximal to these stands. [22021] ET	X	X	X	X	X
***Micarea* sp. #1** Known only from small, poorly consolidated sedimentary rock fragments in exposed sandy soil embankments. This lichen has a diffuse whitish thallus with pinkish overtones; the apothecia are abundant, dark brown, convex, and up to 0.25 mm diameter, with irregularly rounded margins; the epithecium reacts KOH+ violet; the ascospores are simple, and ca 6-7 µm long. [*21816*] UNK			X		
***Micarea* sp. #2** Known from Bald Cypress and Loblolly Pine in established woodlands. This is a small, greenish gray, granular-areolate crust with strongly convex, dull blackish brown apothecia to 0.3 mm diameter; exciple totally absent; epithecium grayish olive, KOH+ violet; hypothecium pale brown, KOH-; hymenium squat, the paraphyses branched and anastomosing; ascospores straight, acicular, ca. 20 x <3 µm. The ascus seems *Bacidia*-like, indicating that it could be a *Scoliciosporum*, but the other characters appear more evocative of *Micarea*. [*21959,* 22026] UNK			X		X
***Minutoexcipula tuckerae* V. Atienza & D. Hawksw.** Occasional parasite on thalli of *Pertusaria texana*. [21866, *22112*] ET					
***Monoblastia rappii* Zahlbr.** Known only from the shaded bole of a Green Ash in a swampy woodland, but possibly overlooked and more common than indicated. Little is known about this seldom collected lichen. There are specimens at NY from Florida, Mississippi, and South Carolina. Shirley Tucker (pers. com.) mentions a specimen from Louisiana (*Tucker 13314* LSU). The Pine Bluff population is a northwestern range disjunction. [*21909*] CP					X
***Mycocalicium subtile* (Pers.) Szat.** Uncommon on decorticate rotting wood on pine and hardwood snags, usually in microhabitats not exposed to direct rainfall. [21768, 21874] PT			X		X
***Myelochroa aurulenta* (Tuck.) Elix & Hale** Common on shaded bases and lower boles of hardwoods in all types of habitats, and infrequently on shaded lower portions of pine boles. [21776, 21875] ET	X	X	X	X	X

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	**P**	**R**	**T**	**Y**
***Myelochroa galbina* (Ach.) Elix & Hale** Apparently rare; known only from canopy branches of oaks in the Yellow Lake unit, although certainly occurring in similar habitats elsewhere in the site. [21950] ET	X	X		X	X
***Ochrolechia africana* Vain.** Common on upper boles and canopy branches of hardwoods in mature stands. [22005, 22077] PT	X	X	X	X	X
***Opegrapha varia* Pers.** Occasional on shaded hardwood boles in mesic sites, often along streams. [*22095,* 22099, 22133] PT	X	X		X	X
***Opegrapha viridis* (Pers. ex Ach.) Behlen & Desberger** Uncommon on shaded, smooth-barked hardwoods in wet-mesic woodlands. Horse Sugar (*Symplocus tinctoria*) is a typical substrate. [*21796*] ET	X		X	X	X
***Opegrapha vulgata* Ach.** Uncommon on shaded, smooth-barked hardwoods; currently known only from woodlands outside of the five study units. [*21934*] UNK					
***Opegrapha* sp. 82 *sensu* Harris (1995)** Known from the lower bole of a Box Elder. The apothecia of this species are somewhat evocative of diminutive apothecia of *O. varia*, but the hymenium is inspersed and the ascospores average somewhat larger. Previous to the discovery at Pine Bluff, this undescribed lichen was known only from Florida. [21911] CP					X
***Parmelinopsis horrescens* (Taylor) Elix & Hale** Infrequent on lightly shaded boles of Bald Cypress in wet depressions. [22029, *22033*] ET(S)			X		
***Parmelinopsis minarum* (Vain.) Elix & Hale** Occasional and widely distributed in mature woodlands through the site, on lightly shaded boles of hardwoods, Bald Cypress, and, less commonly, pines. [21873] ET(S)	X	X	X	X	X
***Parmotrema austrosinense* (Zahlbr.) Hale** Frequent on canopy branches and upper boles of hardwoods in mature stands, typically associated with *P. hypotropum*. [21829, 22019] MW(S)	X		X	X	X
***Parmotrema hypotropum* (Nyl.) Hale** Common on lightly shaded to exposed boles and branches of hardwoods, pines, and Bald Cypress; characteristic of canopy branches in mature stands in both bottomland and upland habitats. [21907, 22080] ET	X	X	X	X	X
***Parmotrema perforatum* (Jacq.) A. Massal.** Common and characteristic in hardwood canopies in all types of mature woodlands, but especially in mesic habitats. [21922, 21998] ET	X	X	X	X	X
***Parmotrema reticulatum* (Taylor) M. Choisy** Common on lightly shaded bases, boles, and larger branches of hardwoods, as well as on large decorticate logs in woodlands, and occasionally on conifer boles and bases. [21785, 21791, 22004] PT	X	X	X	X	X
***Parmotrema subisidiosum* (Müll. Arg.) Hale** Occasional on lightly shaded hardwood boles in mature stands, typically growing on Southern Red Oak. [21822, *22105A*] CP	X		X	X	
***Parmotrema submarginale* (Michx.) dePriest & B. Hale** Rare on lightly shaded boles of Bald Cypress, and probably occurring on canopy branches of hardwoods. [22037] ET(S)			X		
***Parmotrema subtinctorium* (Zahlbr.) Hale** Frequent on shaded boles and larger branches of hardwoods in mature woodlands, and infrequently on conifer bases and	X	X	X	X	X

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	**P**	**R**	**T**	**Y**
lower boles. Chemical strains with and without salazinic acid occur at the site, with the strain containing salazinic acid much more abundant. [salazinic acid: 21864, 21973, 22049, 22106; no salazinic acid: 21896B] PT					
***Peltigera cf. polydactylon* (Necker) Hoffm.** Infrequent and local on lightly shaded, well-drained sandy soil embankments such as on steep slopes where competition from vascular vegetation and accumulation of leaf litter are minimal. [*21819*] UNK				X	
***Pertusaria amara* (Ach.) Nyl.** Occasional on lightly to moderately shaded hardwood boles in established woodlands. Typical substrates include Hornbeam, Southern Red Oak, and Beech. [21781, 22060, 22063] PT	X	X	X	X	X
***Pertusaria hypothamnolica* Dibben** Occasional on lightly shaded to exposed boles and larger branches of hardwoods, usually in upland habitats. [21825, 21880, 21938, 21953] ET				X	X
***Pertusaria ostiolata* Dibben** Common on shaded lower and mid boles of hardwoods in mature stands, typically in moist to dry-mesic habitats. [21767, 21783, 21789, 21841, 21881] ET(S)	X	X	X	X	X
***Pertusaria paratuberculifera* Dibben** Common and widely distributed, mostly on mid boles of a variety of hardwoods (rarely on Bald Cypress), and most abundant in mature stands. [21823, 21824, 21840, 21870, 21971, 21984, 21990, 22050] ET	X	X	X	X	X
***Pertusaria pustulata* (Ach.) Duby** Common on canopy branches of hardwoods in woodlands, and on younger hardwood substrates along wooded roadsides and woodland edges. [21923, 21931, 22058, 22067] ET	X	X		X	X
***Pertusaria subpertusa* Brodo** Occasional; typically on boles and shaded lower limbs of smooth-barked hardwoods in mature stands. Typical substrates include Hornbeam and Serviceberry (*Amelanchier arborea*). [21773, *22069*] ET	X	X	X		X
***Pertusaria texana* Müll. Arg.** Very common on lightly shaded hardwoods in all woodland types, especially on upper boles and lichenose canopy branches. [21780, 21847, 21857, 21980, 22022, 22043, 22044, 22070, 22078, 22081] ET(S)	X	X	X	X	X
***Pertusaria velata* (Turner) Nyl.** Despite its general abundance in the Interior Highlands, at Pine Bluff Arsenal this lichen is relatively uncommon, occurring on shaded hardwood boles in mature stands. Local populations lack lichexanthone. [21940] ET	X		X		
***Phaeocalicium polyporaeum* (Nyl.) Tibell** Occasional on thalli of Turkeytail Fungus [*Trichaptum biforme* (Fr. in Kl.) Ryvarden] on rotting logs in woodlands. [21779] ET			X		X
***Phaeophyscia hirtella* Essl.** Occasional, but locally common, on exposed to lightly shaded branches and boles of hard-barked hardwoods, often in weedy or successional habitats. [21899, 21905, 21948] PT					X
***Phaeophyscia pusilloides* (Zahlbr.) Essl.** Common on shaded bases and boles of hardwoods in all types of woodlands, and rarely on shaded old concrete. [21801, 21926, 22105B] ET	X	X	X	X	X
***Phaeophyscia rubropulchra* (Degel.) Essl.** Common on shaded bases and lower boles of hardwoods, and occasionally on upper boles, larger canopy branches, and shaded decorticate logs. Although commonly associated with *P. pusilloides*, this species is	X	X	X	X	X

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	P	R	T	Y
modal in slightly more shaded conditions and more apt to range lower on the bole of a given tree. [21806] ET					
***Phlyctis ludoviciensis* (Müll. Arg.) Lendemer** Uncommon on well-shaded, smooth-barked, typically small hardwoods in mesic habitats, usually along small streams. [*21784*] CP			X		
***Phyllopsora corallina* (Eschw.) Müll. Arg.** Frequent on shaded bases of large hardwoods in mature stands, where it can dominate the lichen vegetation of a given tree base, and not be present on any other tree in the immediate vicinity. Populations with and without atranorin both occur at the arsenal. [21770] CP	X	X	X	X	X
***Physcia americana* G. Merr.** Frequent on mid and upper boles and canopy branches of hardwoods, usually growing in light shade. [21800] ET	X	X	X	X	X
***Physcia millegrana* Degel.** Common on exposed to lightly shaded hardwood substrates in all conditions, but most abundant in weedy or disturbed areas or successional woodlands. [21792] ET	X	X	X	X	X
***Physcia pumilior* R. C. Harris** Common on upper canopy branches of hardwoods and, more rarely, pines. [21831, 21949, 22065] ET	X	X	X	X	X
***Physcia stellaris* (L.) Nyl.** Apparently common, with an ecology similar to that of *P. pumilior*, although perhaps more apt to occur in disturbed habitats such as on branches in thickets and younger successional woodlands. [21916, 22018, 22097] PT		X	X		X
***Physciella chloantha* (Ach.) Essl.** Infrequent on twigs, branches, and boles of hardwoods and Bald Cypress, usually in wet habitats. [22042] ET		X	X		
***Placynthiella icmalea* (Ach.) Coppins & P. James** Occasional on rotting, decorticate logs in established woodlands. [21888] PT	X			X	X
***Porina heterospora* (Fink) R. C. Harris** Locally frequent on shaded, smooth-barked hardwoods in mesic or wet habitats. Hornbeam is a preferred substrate. [21957, 22113, *22124*] CP	X	X			X
***Pseudosagedia cestrensis* (E. Mich.) R. C. Harris** Frequent on shaded, usually smallish, hardwood boles and lower branches in mesic to moist woodlands; usually on less acidic-barked trees. [21797, 21902, 21921, *22131*] ET	X	X	X	X	X
***Pseudosagedia isidiata* (R.C. Harris) R.C. Harris** Known only from the lower bole of Green Ash in a swamp in the Yellow Lake Unit. [21900] UNK					X
***Punctelia missouriensis* G. Wilh. & Ladd** Infrequent on lightly shaded bases and lower boles of hardwoods, prevailingly oaks, in wooded uplands. Though this species was originally reported to have a distribution largely restricted to the mid-western United States, it has subsequently been found to be common throughout parts of the eastern U.S. (e.g. Hodkinson & Case 2008, Hodkinson et al. 2009, Perlmutter 2005). [21769] ET			X		X
***Punctelia rudecta* (Ach.) Krog** Very common throughout the site, on boles and larger branches of hardwoods and conifers, and occasionally on decorticate logs; undoubtedly the most abundant macrolichen at Pine Bluff Arsenal. [22001] ET	X	X	X	X	X
***Pyrenula citriformis* R. C. Harris** Occasional on shaded hardwoods in moist sites. [*21799, 22071*] CP		X	X		

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	**P**	**R**	**T**	**Y**
***Pyrenula pseudobufonia* (Rehm) R. C. Harris** Frequent on mid and upper boles of hardwoods in established stands. [21782, 22012, 22055] ET	X	X	X	X	X
***Pyrenula ravenelii* (Tuck.) R. C. Harris** Occasional on shaded lower boles of smooth-barked hardwoods in moist to mesic woodlands. [*22074,* 22075, *22123*] ET(S)	X	X	X		
***Pyrrhospora varians* (Ach.) R. C. Harris** Common on exposed to lightly shaded hardwood substrates, usually on twigs and younger branches in both successional and mature woodlands. [21975] ET	X	X	X	X	X
***Pyxine sorediata* (Ach.) Mont.** Occasional on shaded hardwood boles in woodlands, typically in upland habitats. [22006] ET	X	X	X	X	X
***Pyxine subcinerea* Stirt.** Common on boles and branches of hardwoods, Bald Cypress, and, less frequently, pines. [21775, 21867, 22040, 22110] ET	X	X	X	X	X
***Ramalina americana* Hale** Occasional on lightly shaded upper boles and canopy branches of hardwoods in mature stands. [21904] ET	X	X	X		X
***Ramonia microspora* Vězda** Locally frequent on shaded bases of Southern Red Oaks in a portion of the Refuge Woods unit. An uncommon or overlooked lichen of southeastern affinities. Tucker (1981) first reported this species in North America, from Louisiana. At NY, there are specimens from Arkansas, Florida, Georgia, Missouri, and North and South Carolina. [21988, 21989] CP			X		
***Rinodina maculans* Müll. Arg.** Common on canopy branches and sometimes upper boles of hardwoods in mature stands; rarely on Bald Cypress branches. [21919, 21935, 21995, *22031*] UNK	X		X	X	X
***Rinodina cf. subminuta* H. Magn.** Occasional; usually on shaded lower boles of hardwoods in uplands or open mesic stands. Southern Red Oak is the most common substrate. [*21987*] ET	X	X	X		X
***Robergea pupula* (Nyl.) R. C. Harris** Although not lichenized, this whitish crustose fungus is often mistaken for a lichen, especially *Conotrema urceolatum*. At Pine Bluff Arsenal, *Robergea* is frequent on lightly shaded hardwoods in dry to mesic sites. *Robergea* is characterized by frequent dark elevated ascomata which open by offset slits set in whitish pruinose disks. [21893] ET		X	X	X	X
***Sarcogyne regularis* Körb.** Occasional on exposures of old, weathered concrete, often in less exposed sites than are characteristic for *Caloplaca feracissima*. [22096] PT		X			
***Schismatomma glaucescens* (Nyl. ex Willey) R. C. Harris** Known from a single collection, but cryptic, easily overlooked, and probably more common than this would indicate. It was found on the upper bole of a large canopy Water Oak along Phillips Creek. Little is known regarding the distribution or status of this cryptic lichen, which is documented only from Massachusetts, North Carolina, and the Ozarks. [*22056*] ET		X			
***Strigula viridiseda* (Nyl.) R. C. Harris** Known only from the shaded bole of a small *Carya*. [*22094*] CP		X			
***Trapeliopsis flexuosa* (Fr.) Coppins & P. James** Locally frequent on lightly shaded bases and lower boles of pines, and occasionally on decorticate pine and hardwood logs in wooded uplands. [21846] PT	X	X		X	X

E-Eastwood Bayou; **P**-Phillips Creek; **R**-Refuge Woods; **T**-Tripletts Bluff; **Y**-Yellow Lake

	E	P	R	T	Y
***Usnea endochrysea* Stirt.** Infrequent on upper boles and larger canopy branches of hardwoods, typically Red Maple, Water Oak, and Willow Oak, in mature stands. At Pine Bluff Arsenal, this lichen is sporadically distributed and occurs in significant numbers only in the Phillips Creek unit. Local populations contain usnic and norstictic acids. [22092] ET	X	X		X	
***Usnea mutabilis* Stirt.** Known only from exposed branches of Bald Cypress in a ponded depression in the Refuge Woods unit. [22046] ET			X		
***Verrucaria* sp. #1** Known from small siliceous rock fragments scattered in the soil along the boat ramp at Tulley Lake. This lichen is characterized by a scurfy, subareolate, sordid dark greenish gray thallus with small, partially immersed black perithecia ca. 0.10 mm broad; the ascospores appear somewhat misshapen and irregular and are ca. 18 µm long. [21946] UNK					
***Verrucaria* sp. #2** Known only from weathered concrete on a low wall and culvert system along Sibert Road. In the field this species is not evocative of a *Verrucaria*, but appears more like *Anisomeridium distans*, with scattered, superficial, globose, lustrous black perithecia ca. 0.12 mm wide and a diffuse, scurfy, thin whitish thallus; the ascospores are ca. 19 x 8 µm. [21930] UNK					
***Vulpicida viridis* (Schwein.) Mattson & Lai** Occasional on exposed to lightly shaded upper boles and canopy branches of hardwoods in mature stands, usually in uplands. [21830] ET(S)	X			X	X
***Xanthomendoza weberi* (S. Kondr. & Kärnefelt) L. Lindblom** Occasional and sporadically distributed, on exposed to lightly shaded hardwood boles, typically along edges or openings. [21805] PT			X	X	
Lecanoraceae, genus unknown (*Scoliciosporum*? or perhaps an undescribed genus?) Known from the shaded lower bole of an old growth Bald Cypress. This species has a grayish green thallus composed of aggregated globose granules to 0.25 mm; apothecia are black, lustrous, globose, slightly irregular, to 0.4 mm diameter; epithecium dark gray with localized lavender overtones, turning KOH+ dark greenish gray; hypothecium grayish brown, KOH+ lavender brownish; asci *Lecanora*-type; ascospores acicular. Richard Harris of the New York Botanical Garden (pers. comm.) has collected a similar specimen on Bald Cypress in Florida. [21855] UNK				X	
unknown sterile crust Known from bark of Bald Cypress in relatively high light intensities in a ponded depression. This small yellow to yellowish green crust has small minutely lobed squamules that develop minute globose lobules ca. 0.08 mm diameter. It reacts UV-, KOH-, KC+ orange, and contains what appears to be secalonic acid A. [22030] UNK			X		

Conclusions

This study provides the first floristic information about the lichen biota of the northwestern portion of the coastal plain. Pine Bluff Arsenal supports a rich lichen biota, including several species of conservation significance, and extends the known ranges for several southeastern species throughout the coastal plain region. Although most of the property has a history of previous disturbance dating to pre-arsenal agricultural activities, the intensive development and habitat destruction in the surrounding landscape has left the landscape of Pine Bluff Arsenal as an island of intact or restorable habitat of sufficient size to be potentially sustainable.

The presence of a pulp mill immediately upwind from the arsenal and its associated atmospheric discharges may have impacted on the lichen biota, but this is merely conjectural. It is not known if there were significant atmospheric discharges of pollutants during previous production cycles at the arsenal itself. Certainly the lichen abundance and richness at the site is slightly less than would be anticipated for intact habitats, but the potential role of air pollution versus habitat perturbation is impossible to determine. A number of species ranked as having some level of sensitivity to sulfur dioxide are present at the site today, and appear healthy. These lichens include *Buellia stillingiana, Caloplaca cerina, Candelaria concolor, Cladonia cristatella, Flavoparmelia caperata, Graphis scripta, Opegrapha varia, Pertusaria amara, Punctelia rudecta, Ramalina americana, Rimelia reticulata*, and *Usnea*.

In summary, Pine Bluff Arsenal supports a diverse cohort of lichens with strong affinities to the coastal plain of the southeastern United States. As such, it represents an edge of range outlier for this association pattern, and includes many taxa of potential conservation significance. Management actions aimed at restoring site integrity and natural communities should, if properly conceived and implemented, sustain and potentially enhance the lichen biota

Acknowledgements

This paper is dedicated to Richard Harris to commemorate his transformational contributions to North American lichenology. He has served as a patient mentor and colleague for two decades. Appreciation is also extended to William Buck, Blane Heumann, Caleb Morse, Mike Pederson, Cindy Pessoni and Douglas Zollner for their input and assistance. Brendan Hodkinson and Shirley Tucker provided particularly insightful and helpful review comments and suggestions. This project was supported by United States Department of Defense contract DAMD17-99-2-9038.

Literature Cited

Brodo, I.M., S.D. Sharnoff and S. Sharnoff. 2001. Lichens of North America. New Haven, CT: Yale University Press. xxiv + 795 pp.

Campbell, J.C., L. Peacock, and S.A. Walker. 1997. Pine Bluff Arsenal survey of threatened and endangered plants, vegetation/natural areas. The Nature Conservancy, Little Rock, AR: final report to Pine Bluff Arsenal. 123 pp.

Culberson, C.F. and A. Johnson. 1982. Substitution of methyl *tert*-butyl ether for diethyl ether in the standardized thin-layer chromatographic method for lichen products. Journal of Chromatography, 238: 483-487.

Culberson, C.F. and H. Kristinsson. 1970. A standardized method for the identification of lichen products. Journal of Chromatography, 46: 85-93.

Diederich, P. 2003. New species and new records of American lichenicolous fungi. Herzogia, 16: 41-90.

Ekman, S. 1996. The corticolous and lignicolous species of *Bacidia* and *Bacidina* in North America. Opera Botanica, 127: 148 pp.

Esslinger, T.L. 2009. A cumulative checklist for the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. North Dakota State University: http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm (First posted 1 December 1997, Most recent version [#15] 27 August 2009). Fargo, ND.

Harris, R.C. 1973. The corticolous pyrenolichens of the Great Lakes region. Michigan Botanist, 12: 3-68.

Harris, R.C. 1988. *Buellia* in north and central Florida or the virtues and rewards of collecting. Evansia, 5: 37-45.

Harris, R.C. 1995. More Florida lichens. Published by the author, New York Botanical Garden, Bronx, NY. 192 pp.

Harris, R.C. & D. Ladd. 2005. Preliminary Draft: Ozark Lichens. Enumerating the Lichens of the Ozark Highlands of Arkansas, Illinois, Kansas, Missouri, and Oklahoma. Prepared for the 14th Tuckerman Lichen Workshop, Eureka Springs, Arkansas.

Hodkinson, B.P. 2010. A first assessment of lichen diversity for one of North America's "biodiversity hotspots" in the southern Appalachians of Virginia. Castanea, 75: in press.

Hodkinson, B.P., and M.A. Case. 2008. A lichen survey of Williamsburg, Virginia. Banisteria, 31: 24-30.

Hodkinson, B.P., R.C. Harris, and M.A. Case. 2009. A Checklist of Virginia Lichens. Evansia, 26(2): 64-88.

Ladd, D. 1996. Lichen assessment and monitoring in two oak woodlands, Mark Twain National Forest, Missouri. Final Report, USDA Forest Service contract 40-64R7-3-50. 67 pp.

Ladd, D. 2000. Lichens of Pine Bluff Arsenal, Arkansas. The Nature Conservancy, Little Rock, AR: final report to United States Department of Defense under contract DAMD 17-99-2-9038. 36 pp.

Ladd, D. and J.K. Grabner. 1998. The MOFEP lichen project: profiling the lichen vegetation of the Ozark Highlands. Inoculum [Mycologia, 49(2) suppl.]: 59.

Ladd, D., R.C. Harris and W.R. Buck. 2009. Lichens and related fungi of Highstead Arboretum, Fairfield County, Connecticut. Opuscula Philolichenum, 6:81-86.

Lendemer, J.C. and B.P. Hodkinson. 2009a. Stretching the boundaries: a range extension for *Buellia wheeleri* R.C. Harris. Evansia, 26(4): in press.

Lendemer, J.C., and B.P. Hodkinson. 2009b. The Wisdom of Fools: New molecular and morphological insights into the North American apodetiate species of *Cladonia*. Opuscula Philolichenum, 7: in press.

Perlmutter, G.B. 2005. Lichen checklist for North Carolina, USA. Evansia, 22: 51-77.

Sheard, J.W. and P.F. May. 1997. A synopsis of the species of *Amandinea* (lichenized Ascomycetes, Physciaceae) as presently known in North America. Bryologist, 100: 159-169.

The Nature Conservancy (TNC). 1999. Ecoregional map of the United States, May 1999 edition. The Nature Conservancy, Arlington VA.

Tucker, S.C. 1981. Checklist of Louisiana lichens. Proceedings of the Louisiana Academy of Science, 44: 58-70.

Westburg, M., U. Arup and I. Kärnefelt. 2007. Phylogenetic studies in the Candelariaceae (lichenized Ascomycotina) based on nuclear ITS DNA sequence data. Mycological Research, 111: 1277-1284.

Wetmore, C.M. 1992. Lichens and air quality in Hercules Glade Wilderness of Mark Twain National Forest. Final report, USDA Forest Service contract 42-649. 22 pp.

Opuscula Philolichenum, **7**: 121-186. 2009.

Lichenicolous fungi and lichens from the Holarctic. Part II.

Mikhail P. Zhurbenko[1]

ABSTRACT. – A total of 141 species of lichenicolous fungi, 12 lichenicolous lichens, and 94 biogeographically interesting non-lichenicolous lichens, mainly from the Russian Arctic, are reported and many are discussed. *Corticifraga fusispora* sp. nov. (on *Peltigera*), *Odontotrema japewiae* sp. nov. (on *Japewia*), and *Opegrapha pulvinata* var. *placidiicola* var. nov. (on *Placidium*) are described from Russia. *Dactylospora rinodinicola* is reduced to synonymy with *D. deminuta*. New to North America: *Didymellopsis latitans*, *Epilichen glauconigellus, Polycoccum bryonthae, Psora elenkinii, Stigmidium solorinarium*, and *Unguiculariopsis refractiva*. New to Asia and Russia: *Adelococcus alpestris, Arrhenia peltigerina, Arthrorhaphis olivacea, Buellia lecanoricola, Epibryon solorinae, Hobsoniopsis santessonii, Lecidea polytrichinella*, *Lichenochora coppinsii, L. elegantis, Muellerella atricola, Odontotrema cuculare, Opegrapha geographicola*, *Phaeoseptoria peltigerae, Phoma denigricans, P. physciicola, Polydesmia lichenis, Pronectria walkerorum, Rhagadostoma brevisporum, Roselliniella pannariae, Sclerococcum montagnei, Scutula dedicata, Tremella christiansenii, Trichosphaeria lichenum, Unguiculariopsis thallophila, Weddellomyces protearius, Zwackhiomyces immersae*, and *Z. physciicola*. New to Asia, but not Russia: *Capronia peltigerae, Dacampia rufescentis, Lasiosphaeriopsis salisburyi, Lichenochora weillii, Pronectria minuta, P. tibellii, Reconditella physconiarum, Skyttea tephromelarum, Stigmidium mitchellii*, and *Xenonectriella ornamentata*. New to Russia, but not Asia: *Chaenothecopsis parasitaster, Polycoccum crassum, Rhymbocarpus geographici, Stigmidium psorae, S. squamariae, Vouauxiomyces santessonii*, and *Zwackhiomyces coepulonus*. New to Kyrgyzstan: *Stigmidium solorinarium*. New to Mongolia: *Cercidospora verrucosaria*. New to the Arctic: *Aspicilia transbaicalica, Dactylospora homoclinella, Didymellopsis latitans*, *Epibryon solorinae, Hobsoniopsis santessonii, Lasiosphaeriopsis salisburyi, Lecanora baicalensis, Lichenochora coppinsii, L. elegantis, Lichenoconium xanthoriae, Lichenostigma elongatum, Lobaria epovae, Muellerella atricola, Opegrapha geographicola, O. pulvinata, Phaeoseptoria peltigerae, Phoma denigricans, P. peltigerae, P. physciicola, Polycoccum crassum, Polydesmia lichenis, Psora elenkinii, Reconditella physconiarum, Rhymbocarpus geographici, Roselliniella pannariae, Sclerococcum montagnei, Scutula dedicata, S. epiblastematica, Skyttea tephromelarum, Stigmidium squamariae, Tremella christiansenii, Trichosphaeria lichenum, Unguiculariopsis thallophila, Weddellomyces protearius, Xenonectriella lutescens, Zwackhiomyces immersae*, and *Z. physciicola*. New to the American Arctic: *Arthonia glebosa, Caloplaca epithallina, Polycoccum bryonthae, Psorula rufonigra, Scutula tuberculosa, Stigmidium solorinarium, S. tabacinae*, and *Unguiculariopsis refractiva*. New to Greenland: *Taeniolella diederichiana*. New to Svalbard: *Graphium aphthosae, Llimoniella groenlandiae*, and *Polycoccum bryonthae*. New to the Russian Arctic: *Caloplaca tominii, Dactylospora homoclinella, Glypholecia scabra, Lecanora argentea, L. cavicola, Neolamya peltigerae, Phaeospora peltigericola, Polycoccum pulvinatum, Psora vallesiaca, Rhagadostoma brevisporum, Rimularia insularis, Squamarina lentigera, Stigmidium mitchellii, Tetramelas phaeophysciae*, *Xenonectriella ornamentata,* and *Zwackhiomyces coepulonus*. Twenty species of lichenicolous fungi or lichens are reported on new host genera, and 35 species on new host species.

Introduction

This paper continues the publication of records of lichenicolous fungi and lichens from the Holarctic that began in this journal earlier this year (Zhurbenko 2009a). It is mainly intended to fill gaps in the Panarctic catalogue of lichens and lichenicolous fungi (Kristinsson et al. 2009), as well as to formally publish the distribution data of some species included in Kristinsson et al. (2009) or Zhurbenko (1996) on the the basis of the author's unpublished records. Pertinent comments on the systematics, geography and/or ecology of the treated taxa are provided. Three lichenicolous taxa are also described as new to science.

[1]Mikhail P. Zhurbenko – Lab. of the Systematics and Geography of Fungi, Komarov Botanical Institute, Russian Academy of Sciences, Professor Popov 2, St.-Petersburg, 197376, Russia. – e–mail: mzhurb@gmail.com

Materials and Methods

The study is mostly based on about 630 specimens collected by the author during his field work in the Arctic and some other regions from 1983 to 2009. Additional finds occurred in unidentified lichen material from about 40 collectors (see acknowledgements) donated to the author. Lichenicolous fungi were specifically searched for in the Arctic lichen collections of the following hosts: *Acarospora, Baeomyces, Evernia, Fulgensia, Fuscopannaria, Lecanora, Melanelia, Peltigera, Phaeophyscia, Physcia, Physconia, Protopannaria, Psoroma, Ramalina, Rhizocarpon, Rinodina, Solorina, Tephromela*, and *Xanthoria*.

The material was examined and photographed using Zeiss microscopes Stemi 2000-CS and Axio Imager A1 equipped with Nomarski differential interference contrast optics. Microscopical examination was done in water, 10% KOH (K), Lugol's iodine, directly (I) or after a KOH pre-treatment (K/I) or Brilliant Cresyl blue (BCr) solutions. The length, breadth and length/breadth ratio (l/b) of asci and ascospores are given as: (min–){$\overline{X}$-SD}–{$\overline{X}$+SD}(–max), where min and max are the extreme values, $\overline{X}$ the arithmetic mean, and SD the corresponding standard deviation. Microscopical measurements were made in water, unless otherwise indicated. Sizes of asci were rounded to the nearest 1 μm, those of ascospores to the nearest 0.5 μm. Terms for simple plane shapes mostly follow Stearn (1992: 539), for color Colour Identification Chart (1969) or Petersen (1996). Authors of host lichens match Index Fungorum (2009) and are omitted. Classification and nomenclature of taxa above the generic level follow Lumbsch & Huhndorf (2007). Novelty and rarity of the treated taxa in the Arctic was mostly derived from Kristinsson et al. (2009), that of lichenicolous fungi in Russia from Zhurbenko (2007b, 2009a). Collections of lichenicolous fungi and lichens examined during this study are preserved in LE-Fungi and the numbers following each citation refer to the herbarium numbers of that institution. A few duplicates have been deposited in M and hb. Diederich. Lichen specimens are deposited in ALA, F, FR, H, GZU, KPABG, LE-Lichens, M, UPS and herb. Zhurbenko.

Catalogue

Abbreviations: ap. – apothecia, hb. MZ – herb. Zhurbenko; Is. – Island(s), Mt(s). – Mountain(s), MZ – M. Zhurbenko, Pen. – Peninsula, th. – thallus.

I. – Lichenicolous Fungi

1. *Abrothallus parmeliarum* (Sommerf.) Arnold

Note. – Pathogenicity not observed.

Specimens Examined. All specimens from stony dwarf shrub tundra on thalli of *Parmelia omphalodes* ssp. *glacialis*. – **RUSSIA. TAIMYR PEN.:** Dikson Is., 73°30'N, 80°20'E, alt. 30 m, 7.vii.1990, *MZ 90788* (LE 260293); Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 20–30 m, 12.vii.1990, *MZ 90805* (LE 260113); 14.vii.1990, *MZ 90796* (LE 260263); Byrranga Mts., Bol'shaya Bootankaga River, 74º20'N, 98º05'E, alt. 200–300 m, 8.vii.1991, *V. Kuvaev* (LE 260252); 10.vii.1991, *V. Kuvaev* (LE 260242).

2. *Adelococcus alpestris* (Zopf) Theiss. & Syd.

Notes. – Pathogenicity not observed. New to Russia and Asia. *Acarospora putoranica* is a new host species.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Zamknutaya River, 74°37'N, 98°33'E, alt. 150 m, rocks in tundra, on *Acarospora putoranica* (th.), 6.viii.1995, *MZ 95515* (LE 260024).

3. *Arrhenia peltigerina* (Peck) Redhead et al.

Note. – New to Russia and Asia.

Specimen Examined. – **RUSSIA. SAYAN MTS.:** 3 km N of Okinskoe Lake, 51°55'N, 100º40'E, alt. 2000 m, *Betula fruticosa–Rhododendron parviflora–Dryas*–graminoid–moss tundra with sparse *Larix* trees, on lobes of *Peltigera* sp. near a stream, 15.vi.2005, *MZ 05297* (LE 261673).

4. *Arthonia epiphyscia* Nyl.

NOTES. – Infected host's hymenium destroyed, thalli often somewhat bleached. New to Murmansk Region of Russia. *Rinodina* is a new host genus.

SPECIMENS EXAMINED. – **CANADA. NUNAVUT:** Cornwallis Is., Resolute Bay, 74°42'N, 94°56'W, *Salix arctica-Saxifraga oppositifolia*-moss tundra, on *Rinodina roscida* (ap.: hymenium, margins), 6.viii.1999, *N. Matveeva* (LE 260021). **RUSSIA. MURMANSK REGION:** Barents Sea coast, Olenka River mouth, 69°02'N, 36°25'E, alt. 50 m, rocks in tundra, on *Physcia dubia* (th.), 6.ix.1997, *MZ 97358* (LE 233331). **POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°39'E, alt. 250 m, boulder in sparse *Larix* forest, on *P. caesia* (lobes, soralia), 27.vi.1993, *MZ 93151* (LE 260281). **CHUKOTKA:** Vesnovannaya River, 65°20'N, 174°26'E, stony dwarf shrub tundra, on *P.* cf. *dubia* (th.), 14.viii.1980, *I. Makarova* (LE 233518); Ioni Lake, Yanraponta Mt., 65°53'N, 173°44'W, boulder in tundra, on *P. caesia* (th.), 7.vii.1977, *I. Makarova* (LE 233698:a) [indentification somewhat uncertain].

5. *Arthonia fuscopurpurea* (Tul.) R. Sant.

NOTES. – Sometimes growing on decaying host lobes, otherwise pathogenicity not observed. New to Severnaya Zemlya, Taimyr Pen. and Yakutiya. *Peltigera occidentalis* is a new host species.

SPECIMENS EXAMINED. All specimens on *Peltigera* spp. – **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., between Shokal'skogo Strait and Mikoyana Bay, 79°17'N, 101°50'E, alt. 40 m, arctic desert, very abundant on local population of *P. scabrosa* (lobes), 20.vii.1996, *MZ 96958* (LE 233914). **TAIMYR PEN.:** Tareya, 73°20'N, 90°36'E, boggy tundra, on *P. polydactylon*-group (lobes: upper side), 30.vii.1965, *N. Matveeva* (LE 233948). **YAKUTIYA:** Lena River delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, on *P. polydactylon*-group (lobes: upper side), 1.viii.1998, *MZ 98345* (LE 233725); same delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, wet lichen-moss tundra, on *P. occidentalis* (lobes: upper side), 15.viii.1998, *MZ 98329* (LE 233747).

6. *Arthonia molendoi* (Frauenf.) R. Sant.

NOTES. – Infected host tissues sometimes bleached or darkened. New to Nenetz Region of Russia.

SPECIMENS EXAMINED. Hosts of all specimens found on rocks or stones in tundra. – **RUSSIA. NENETZ REGION:** Bol'shoi Tsinkovyi Is. just NW of Vaigach Is., 70°27'N, 58°40'E, on *Xanthoria elegans* (ap.: hymenium), 1997, *V. Shevchenko* (LE 261708). **TAIMYR PEN.:** Byrranga Mts., Zamknutaya River, 74°37'N, 98°33'E, alt. 150 m, on *Caloplaca saxicola* (ap.: discs), 6.viii.1995, *MZ 95523* (LE 261728); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200–250 m, on *C. saxicola* (th., ap.), 20.viii.1995, *MZ 95529:a* (LE 261778:a); on *C. saxicola* (ap.), 26.viii.1995, *MZ 95535:a* (LE 261767:a); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 50 m, on *X. elegans* (ap., th.), 31.vii.1995, *MZ 95531* (LE 261568).

7. *Arthonia peltigerea* Th. Fr.

NOTE. – New to Yakutiya.

SPECIMEN EXAMINED. – **RUSSIA. YAKUTIYA:** Lena River delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, dwarf shrub tundra, on *Solorina saccata* (lobes), 12.vii.1988, *I. Makarova* (LE 233703).

8. *Arthonia peltigerina* (Almq.) H. Olivier

NOTES. – Apothecia convex, occasionally constricted at the base, black, 0.1–0.3(–0.5) mm diam., often confluent, aggregated in groups. Ascospores (12–)13–17(–26) × 5–6(–7) µm, l/b = (1.9–)2.3–3.1(–4.3) (n = 200), almost always 1-septate (one aseptate ascospore observed). Growing on both sides of healthy-looking or decaying *Peltigera* lobes, mostly by their margins; occasionally on phyllidia and cephalodia. Sometimes evidently causes bleaching of host tissues. *Peltigera continentalis, P. elisabethae* and *P. occidentalis* are new host species.

SPECIMENS EXAMINED. All specimens on *Peltigera* spp. – **CANADA. NUNAVUT:** Amund Ringnes Is., 78°25'N 96°45'W, arctic desert, on *P.* cf. *malacea*, 2.viii.1999, *N. Matveeva* (LE 233801:b). **RUSSIA. SEVERNAYA ZEMLYA** (arctic desert)**:** Bol'shevik Is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 10 m, on *P. leucophlebia*, 21.vii.1996, *MZ 96960* (LE 233953); *MZ 96485:b* (LE 260089:b); same is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, on *P. elisabethae*, 10.vii.1996, *MZ 96980* (LE 260069); same is., W coast of Akhmatova Bay, 79°04'N, 102°41–45'E, alt. 20–40 m, on *P.*

leucophlebia, 17.vii.1996, *MZ 96961* (LE 233993); on *P. polydactylon*-group, 18.vii.1996, *MZ 96959* (LE 233973); on *P. leucophlebia*, 18.vii.1996, *MZ 96962* (LE 233963); *MZ 96328:b* (LE 233841:b). **TAIMYR PEN.** (all in dwarf shrub-lichen-moss tundra): Byrranga Mts., Zamknutaya River, 74°36–37'N, 98°33–35'E, alt. 150–250 m, on *P.* cf. *rufescens*, 6.viii.1995, *MZ 95459* (LE 233744); on *P. continentalis*, 24.viii.1995, *MZ 95489:b* (LE 233981:b); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, on *P. canina*, 30.viii.1995, *MZ 95465* (LE 233964); on *P. leucophlebia*, 30.viii.1995, *MZ 95464:a* (LE 233894:a); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 50–120 m, on *P. polydactylon*-group, 30.vii.1995, *MZ 95458* (LE 233704); on *P. leucophlebia*, 31.vii.1995, *MZ 95462* (LE 233774); on *P. rufescens*, 28.viii.1995, *MZ 95460* (LE 233754); on *P. leucophlebia*, 28.viii.1995, *MZ 95461* (LE 233764). **YAKUTIYA:** Lena River delta (all in dwarf shrub-lichen-moss tundra), Kurungnaakh-Sise Is., 72°20' N, 126°18' E, alt. 40 m, on *P. occidentalis*, 1.viii.1998, *MZ 98346:a* (LE 233855:a); on *P. aphthosa*, 8.viii.1998, *MZ 98355* (LE 233954); on *P. polydactylon*-group, 8.viii.1998, *MZ 98357* (LE 233943); same delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, on *P. leucophlebia*, 27.vii.1998, *MZ 98356* (LE 233904); on *P. aphthosa*, 10.viii. 1998, *MZ 98344* (LE 233775); on *P. occidentalis*, 15.viii.1998, *MZ 98343* (LE 233755); Laptevykh Sea coast, 3 km NW of Tiksi, 71°39'N, 128°45'E, alt. 70 m, dwarf shrub tundra, on *P. leucophlebia*, 24.viii.1998, *MZ 98348:b* (LE 233874:b); junction of Indigirka and In'yali Rivers, 65°10'N, 143°10'E, alt. 450 m, sparse *Larix* forest, on *P. extenuata*, 15.vi.1976, *I. Makarova* (LE 233714); on *P. polydactylon*-group, 18.vi.1976, *I. Makarova* (LE 233724). **CHUKOTKA** (both specimens in *Dryas* tundra)**:** Bol'shoi Rautan Is. in Chaunskaya Bay, 69°42 N, 170°10 E, on *P. leucophlebia*, 6.viii.1968, *B. Yurtsev* (LE 233734); Iskaten' Range, Verkhnii Matachingaiveem River, ca. 66°35'N, 179°10'W, on *P. rufescens*, 6.viii.1967, *T. Voronova* (LE 233906).

9. *Arthonia varians* (Davies) Nyl.

NOTE. – New to Taimyr Pen. and Yakutiya.

SPECIMENS EXAMINED. All specimens on *Lecanora rupicola* (ap.: hymenium), growing on rocks in tundra. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Zamknutaya River, 74°36'N, 98°35'E, alt. 250 m, 24.viii.1995, *MZ 95558* (LE 261725); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, 24.vii.1995, *MZ 95568* (LE 261704). **YAKUTIYA:** Laptevykh Sea coast, 5 km S of Tiksi, 71°36'N, 128°58'E, alt. 20 m, 19.vii.1998, *MZ 98400:a* (LE 261604:a).

10. *Arthophacopsis parmeliarum* Hafellner

NOTE. – Pathogenicity not observed.

SPECIMEN EXAMINED. – **U.S.A. ALASKA:** Wrangell Saint Elias Park and Preserve, Yakutat, Lucia Creek, 59°53'N, 139°52'W, alt. 110 m, upland with closed tall shrubs, on *Parmelia sulcata* (th.), 2.vii.2004, *G. Frost* (LE 260201:a).

11. *Arthrorhaphis olivacea* R. Sant. & Tønsberg

NOTES. – Causes strong bleaching. New to Russia and Asia. *Parmeliopsis* is a new host genus.

SPECIMEN EXAMINED. – **RUSSIA. SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°26'E, alt. 1400 m, sparse *Pinus sibirica-Abies sibirica* forest, on *Parmeliopsis ambigua* (th.) above lignum, 19.vii.2009, *MZ 0918* (LE 260041).

12. *Capronia peltigerae* (Fuckel) D. Hawksw.

NOTES. – Hawksworth (1980: 371) reported asci of the species being 80–90 × 15–20 µm, 8-spored, with walls apically markedly thickened with an elongated internal canal; ascospores hyaline, with rounded apices, 19–24 × 6–8 µm. In our material asci were often 60–70 × 10–13 µm, with an apically almost not thickened wall without the canal, 4–8-spored; ascospores hyaline then pale grey, narrowly elliptic, with acute apices, (18–)19–23(–25) × 4.5–5.5(–6) µm, l/b = (3.0–)3.5–4.5(–5.5) (n = 39), (1–)3-septate, not or rarely constricted at median septum, non-halonate, biseriate in an ascus. It is noteworthy that similar narrower ascospores were reported for this species by Zhurbenko and Laursen (2003). Growing on the underside of old or healthy-looking *Peltigera* lobes, mostly along raised margins. Pathogenicity not observed. New to Asia and to Taimyr and Yakutiya regions of Russia.

SPECIMENS EXAMINED. – **RUSSIA. TAIMYR PEN.:** Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, on *Peltigera malacea*, 4.ix.1995, *MZ 95456* (LE 233785). **YAKUTIYA:** Indigirka River before Momskie Rapids, 65°25'N, 142°43'E, alt. 400 m, *Larix* forest, on *P. aphthosa*, 18.vii.1992, *MZ 92560* (LE 233845).

13. *Carbonea aggregantula* (Müll. Arg.) Diederich & Triebel

Notes. – Pathogenicity not observed. New to Taimyr Pen., Yakutiya and Chukotka.

Specimens Examined. All specimens on *Lecanora polytropa* (th.; ap.: margins). – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°28'E, alt. 160 m, rocks in tundra, 12.viii.1995, *MZ* 95565:b (LE 261624:b). **YAKUTIYA:** lower Lena River, Tit-Ary Is., 71°58'N, 126°18'E, alt. 20 m, on rocks among forest-tundra, 17.vii.1988, *I. Makarova* (LE 261504:b); Kharaulakh Range, Yuryung-Kysam Urochishche opposite Tit-Ary Is., 71°59'N, 126°19'E, alt. 150 m, rocks in tundra, 13.viii.1997, *Yu. Cherkasova* (LE 261585). **CHUKOTKA:** Televeem River, 65°50'N, 175°05'E, on stone in tundra, 19.vii.1979, *I. Makarova* (LE 261545); Ioni Lake, Gil'mymlinei Mt., 65°53'N, 173°44'W, stony dwarf shrub tundra, 5.vii.1977, *I. Makarova* (LE 261634).

14. *Carbonea supersparsa* (Nyl.) Hertel

Notes. – Pathogenicity not observed. New to Taimyr Pen. *Lecanora geophila* is a new host species.

Specimens Examined. All specimens on *Lecanora* spp. – **RUSSIA. POLAR URAL:** Sob' River, 66°59'N, 65°45'E, alt. 300 m, boulder by a creek in subalpine belt, on *L. intricata* (th.), 24.vii.1986, *MZ 86172* (LE 261694). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 100 m, nival stony tundra, on *L. geophila* (th.), 21.vii.1995, *MZ 95550* (LE 261607); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 120 m, rocks in tundra, on *L. geophila* (th.), 30.vii. 1995, *MZ 95549* (LE 261786); 28.viii.1995, *MZ 95551* (LE 261766).

15. *Carbonea vitellinaria* (Nyl.) Hertel

Notes. – The species has mostly been reported from *Candelariella* spp., but is also known from *Lecanora*, *Lecidea*, and *Rhizocarpon* (Knoph et al. 2004). Ascospores of specimens on *Lecanora* and *Tephromela* are (7–)8.5–12.5(–16) × (5–)5.5–7(–8) µm, l/b = (1.2–)1.4–2.0(–2.8) (n = 40). Pathogenicity not observed. New to Wrangel' Is., the first verified records for Yakutiya. *Tephromela* is a new host genus.

Specimens Examined. – **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°39'E, alt. 150 m, rocks in sparse *Larix* forest, on saxicolous *Lecanora* sp. (th.), 27.vi.1993, *MZ 9393* (LE 261514). **YAKUTIYA:** lower Lena River, N extremity of Kharaulakh Range, Khaya-Yuryakh, 72°22'N, 123°04'E, alt. 100 m, on *Lecanora polytropa* (th.), 2000, *G. Grosse* (LE 261544); same range, Stolb meteostation, 72°22'N, 126°42'E, alt. 160 m, scree *Dryas* tundra, on *Tephromela atra* (th.), 13.viii.1987, *V. Perfil'eva* (LE 261794:b). **WRANGEL' IS.:** Somnitel'naya River, 70°58'N, 179°35'W, on *Candelariella vitellina* (th.), 1985, *B. Yurtsev* (LE 261764:b). **CHUKOTKA:** Uelen, 66°20'N, 169°55'W, stony tundra, on *Lecanora polytropa* (th.), 8.viii.1975, *I. Makarova* (LE 261683).

16. *Cercidospora epipolytropa* (Mudd) Arnold

Notes. – Exciple dark green, sometimes with brown, olive or blue tint. Ascospores hyaline, (ob)lanceolate to narrowly (ob)lanceolate, lower cell often slightly narrower and more attenuated, 1(–2)-septate [one 2-septate spore was observed in LE 261784], not constricted at the septa, 4–8 per ascus, (15–)16.5–20.5(–25) × (4–)5–6(–7) µm, l/b = (2.5–)3.1–4.1(–5.0) (n = 64). In most cases pathogenicity not observed, occasionally infected host tissues somewhat bleached. New to Polar Ural, Wrangel' Is. and Chukotka.

Specimens Examined. All specimens on *Lecanora* spp. – **RUSSIA. MURMANSK REGION:** Tumannyi, 69°01'N, 35°48'E, alt. 100 m, on scree in *Betula nana*-dwarf shrub-moss-lichen tundra, on *L. polytropa* (ap.: hymenium), 10.ix.1997, *MZ 97384* (LE 261644). **POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°37'E, alt. 150 m, boulder field in sparse *Larix* forest, on *L. polytropa* (ap.: discs), 28.vii.1986, *MZ 86113* (LE 261554). **TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 350 m, wet spotty tundra, on *L. geophila* (th.), 18.viii.1995, *MZ 95553:a* (LE 261677:a); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 500 m, wet scree tundra, on *L. geophila* (th., ap.), 20.viii.1995, *MZ 95554* (LE 261537); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 120 m, rocks in tundra, on *L. geophila* (th.), 28.viii.1995, *MZ 95552* (LE 261796). **YAKUTIYA:** Laptevykh Sea coast, E part of Kunga Range, 71°16'N, 129°22'E, alt. 240 m, scree nival tundra, on *L. polytropa* (ap.: hymenium; th.), 3.ix.2000, *V. Kunitskii* (LE 260154). **WRANGEL' IS.:** Somnitel'naya River, 70°58'N, 179°35'W, on *L. polytropa* (ap.: hymenium), 1985, *B. Yurtsev* (LE 261764:a). **CHUKOTKA** [all specimens on *L. polytropa* (ap.: hymenium, occasionally margins) in stony tundra]**:** Bezymyannoe Lake, 66°39'N, 176°40'E, 11.vii.1979, *I. Makarova* (LE 261525); Lorino, 65°29'N, 171°43'W, 6.vii.1972, *I. Makarova* (LE 261534); Sireniki, 64°24'N, 173°54'W, 8.vii. 1983, *I. Makarova* (LE 261784).

17. *Cercidospora parva* Hafellner & Ihlen

Note. – Causes slight bleaching of host thallus.

Specimens Examined. – **RUSSIA. TAIMYR PEN.:** Uboinaya River mouth, 73°36'N, 82°22'E, alt. 10–20 m, spotty dwarf shrub tundra, on *Baeomyces rufus* (th.), 9.viii.1990, *MZ 90734* (LE 260054);10.viii.1990, *MZ 90735* (LE 260155).

18. *Cercidospora punctillata* (Nyl.) R. Sant.

Notes. – Ascospores of specimens on *Protopannaria pezizoides* (18 collections) demonstrated significant variability in number of septa and size: (1–)3–5(–6)-septate, (15–)18–25(–33) × (4–)4.5–6(–7) µm (n = 160). Causes strong bleaching of host tissues. New to Yamal-Nenetz and Yakutiya regions of Russia. *Lecanora* is a new host genus, *Psoroma tenue* a new host species.

Specimens Examined. – **NORWAY. SVALBARD:** Nordenskiöld Land, E coast of Grønfjorden, 4 km S of Barentsburg, 78º02'N, 14º19'E, alt. 20 m, spotty dwarf shrub-lichen-moss tundras, on *Protopannaria pezizoides* (ap., th.), 13.vii.2003, *MZ 03172:a* (LE 260215:a). **RUSSIA. FRANZ JOSEF LAND:** Alger Is., 80°21'N, 56°13'E, arctic desert, on *Psoroma tenue* var. *boreale* (th.), 1.viii.1930, *V. Savicz 1861* (LE 260168). **YAMAL-NENETZ REGION:** Belyi Is., near polar station, 73º18'N, 70º08'E, polygonal tundra, on *Solorina crocea* (ap., th.), 23.vii.2009, *D. Walker* (LE 261769). **SEVERNAYA ZEMLYA** (arctic desert): Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, on *Ps. hypnorum* (th., ap.: hymenium, margins), 10.vii.1996, *MZ 96992:b* (LE 260177); on *Pr. pezizoides* (ap., th., also prothallus over adjacent mosses), 12.vii.1996, *MZ* 961001 (LE 260095); 14.vii.1996, *MZ 96998* (LE 260156); on *Lecanora geophila* (decayed lobe portions), 13.vii.1996, *MZ 961010:a* (LE 261707:a); on *Peltigera leucophlebia* (old th.), 13.vii.1996, *MZ 96953* (LE 233974); same is., between Shokal'skogo Strait and Mikoyana Bay, 79°17'N, 101°50'E, alt. 40 m, on *Pr. pezizoides* (ap., th.), 20.vii.1996, *MZ 96995* (LE 260276); same is., Ostraya Mt. near Mushketova Glacier, 79°11'N, 102°09'E, alt. 200 m, on *Pr. pezizoides* (ap., th.), 11.vii.1996, *MZ 96996* (LE 260166); on *Micarea incrassata* (th.), 11.vii.1996, *MZ 961000* (LE 260245); same is., W coast of Akhmatova Bay, 79°02–04' N, 102°41–42' E, alt. 40–60 m, on *Pel. leucophlebia* (old th.), 16.vii.1996, *MZ 96955:b* (LE 233794:b); 18.vii.1996, *MZ 96954* (LE 233588); same is., middle Golysheva River, 78°26'N, 104°28'E, alt. 170 m, on *Pr. pezizoides* (ap., th.), 4.viii.2000, *N. Matveeva* (LE 260206:a, LE 260296); same is., Cape Antseva, 78°12'N, 103°17'E, alt. 30 m, on *Pr. pezizoides* (th., ap.), 1.viii.1997, *N. Matveeva* (LE 260136); 6.viii.1997, *N. Matveeva* (LE 260026); 18.viii.1998, *N. Matveeva* (LE 260076); 21.viii.1998, *N. Matveeva* (LE 260196:a). **TAIMYR PEN.:** Uboinaya River mouth, 73°36'N, 82°22'E, alt. 10–20 m, spotty dwarf shrub tundra, on *Pr. pezizoides* (ap., th.), 1.viii.1990, *MZ 90708* (LE 260226); 10.viii.1990, *MZ 90709* (LE 260066); 11.viii.1990, *MZ 90710* (LE 260056); Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 20–30 m, *Dryas* tundra, on *Pr. pezizoides* (ap., th.), 12.vii.1990, *MZ 90697* (LE 260265); 13.vii.1990, *MZ 90701* (LE 260236); Byrranga Mts., Bol'shaya Bootankaga River, 74º20'N, 98º05'E, alt. 300 m, stony tundra, on *Ps. hypnorum* (ap.), 8.vii.1991, *V. Kuvaev* (LE 260147); same river, 74°30'N, 97°45'E, alt. 350 m, wet spotty tundra, on *L. geophila* (th.), 18.viii.1995, *MZ 95553:b* (LE 261677:b); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300–400 m, tundra, on *Pr. pezizoides* (ap., th.), 20.vii.1995, *MZ 95505* (LE 260176); on *Pel. leucophlebia* (decayed lobes, overgrown by various terricolous microlichens), 22.viii.1995, *MZ 95492* (LE 233811); same mts., Bikada River, ca. 74°50'N, 106°45'E, alt. 600 m, spotty tundra, on *S. crocea* (th.), 1998, *E. Pospelova* (LE 260087:b). **YAKUTIYA:** Laptevykh Sea coast, 3 km SW of Tiksi, 71°40'N, 128°40'E, alt. 50 m, scree dwarf shrub tundra, on *S. crocea* (decaying lobes), 17.vii.1998, *MZ 98360* (LE 233783). **CHUKOTKA:** junction of Erguveem and Pepenveem Rivers, 65°55'N, 175°50'W, dwarf shrub tundra, on *Pr. pezizoides* (ap., th.), 7.vii.1970, *I. Makarova* (LE 260216).

19. *Cercidospora verrucosaria* (Linds.) Arnold

Notes. – Pathogenicity not observed. New to Polar Ural, South Siberia and Mongolia.

Specimens Examined. All specimens on *Megaspora verrucosa* (th.; ap.: hymenium, margins). – **RUSSIA. POLAR URAL:** Eletz River, 67º02'N, 64º26'E, alt. 100 m, shrub tundra, 29.vi.1993, *MZ 93197* (LE 260053). **SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°28–29'E, alt. 1400–1500 m, on boulders in mountain meadow, 4.vii.2009, *MZ 0927* (LE 260052); 15.vii.2009, *MZ 0926* (LE 260152). **MONGOLIA. UBSUNUR AIMAK:** Tsagan-Khairkhan somon, top of Tsagan-Khairkhan-Ula Mt., 49º23'N, 94º20'E, alt. 2511 m, *Kobrezia* mountain meadow, 5.vii.1976, *L. Biazrov* 2304 (LE 260223).

20. *Cercidospora xanthoriae* (Wedd.) R. Sant.

Notes. – Ascospores straight, 1-septate, with the lower cell not to markedly narrower than the upper one, 15–18(–20) × 4–5 µm, l/b = (3.0–)3.4–4.2(–4.5) (n = 15), 4–8 per ascus. According to Navarro-Rosinés et al. (2004) both cells of ascospores of *Cercidospora xanthoriae* should be of similar shape, but in our material spores with more or less equal and unequal cells occur in the same specimens. Infected host parts sometimes slightly bleached. New to the Russian Arctic and Asian Russia.

Specimens Examined. Both specimens on *Xanthoria elegans* (th., ap.: discs), growing on stones in tundra. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 50–250 m, 28.vii.1995, *MZ 95524* (LE 261608); 31.vii.1995, *MZ 95534* (LE 261668).

21. *Chaenothecopsis parasitaster* (Bagl. & Carestia) D. Hawksw.

Notes. – Infected host parts discolored to brownish. New to Russia and second report for Asia after Japan (Tibell & Thor 2003, Titov 2006). *Cladonia pleurota* is a new host species.

Specimen Examined. – **RUSSIA. SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°31'E, alt. 1450 m, shaded rocks in *Pinus sibirica-Abies sibirica* forest, on *Cladonia pleurota* (basal squamules), 24.vii.2009, *MZ 0913* (LE 260042).

22. *Clypeococcum hypocenomycis* D. Hawksw.

Specimen Examined. – **BELARUS'. VITEBSK REGION:** Berezinsky Reserve, on *Pinus*, on *Hypocenomyce scalaris* (th.), 18.ix.1982, *V. Golubkov* (LE 260246).

23. *Corticifraga fuckelii* (Rehm) D. Hawksw. & R. Sant.

Notes. – Pathogenicity not observed. New to Gydan Pen., Baikal Siberia and Sakhalin Is. *Peltigera occidentalis* is a new host species.

Specimens Examined. All specimens on *Peltigera* spp. – **RUSSIA. MURMANSK REGION:** Girvas Lake, Noda River mouth, 67°45'N, 30°20'E, stony *Picea* forest, on *P. rufescens* (th.), 16.vii.1977, *A. Dombrovskaya* (LE 233418); Kovdor, 67°32'N, 30°30'E, boulder field in low *Betula* forest, on *P. rufescens* (th.), 13.vii.1977, *A. Dombrovskaya* (LE 233438); Kandalakshskii Gulf of White Sea, Velikii Is., Bol'shoe Kumyazh'e Lake, 66°34'N, 33°18' E, rocks in forest, on *P. canina* (th.), 30.viii.1964, *T. Piin* (LE 233508). **GYDAN PEN.:** Eniseyskii Gulf coast, Leskino, 72°20'N, 79°30'E, tundra, on *P. occidentalis* (th.), 6.viii.1972, *R. Yunak & G. Prokop'eva* (LE 233736). **BAIKAL SIBERIA:** Khamar-Daban Range, Chernoe Lake at headwaters of Pereemnaya River, 51°25'N, 105°13'E, taiga forest, on *P.* sp. (th.), 7.viii.1996, *I. Urbanavichene* (LE 233746). **YAKUTIYA:** Lena River delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, dwarf shrub-lichen-moss tundra, on *P. occidentalis* (th.), 27.vii.1998, *MZ 98338* (LE 233776); on *P. occidentalis* (th.), 15.viii.1998, *MZ 98328* (LE 233827); lower Lena River, Tit-Ary Is., 71°58'N, 126°18'E, alt. 15 m, sandy moss tundra, on *P. polydactylon*-group (th.), 20.viii.1998, *MZ 98351* (LE 233854); Indigirka River before Momskie Rapids, 65°25'N, 142°43'E, alt. 400 m, *Larix* forest, on *P. rufescens* (th.), 18.vii.1992, *MZ 92567* (LE 233458). **SAKHALIN IS.:** Bol'shevik Mt. just E of Yuzhno-Sakhalinsk, 46°56'N, 142°46'E, alt. 500 m, sparse *Betula paraermanii* forest, on *P. canina*, 1996, *A. Dobrysh* (LE 233876).

24. *Corticifraga fusispora* Zhurb. sp. nov.

Mycobank #515562.

Plate 1 (Page 129).

Similis *Corticifragae peltigerae,* sed ab ea imprimis differt ascosporis longioribus et angustioribus, 21.5–31 × 4–5 µm.

Type: RUSSIA. **YAKUTIYA:** Lena River delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, on *Peltigera leucophlebia* (upper side of lobes), 8.viii.1998, *MZ 98358* (LE 233983, holotype).

Description. – *Ascomata* apothecioid, bursting through the host cortex and becoming superficial, finally often constricted at the base, angular circular, with slightly concave to plane disc, surrounded by raised, sometimes dentate margin, 0.1–0.3(–0.5) mm diam.; disc glossy, black, occasionally with slight grey-olive hue when dry, translucent cinnamon-buff/sienna when wet, margin always black, aggregated in groups. *Marginal exciple* olive brown, 30–40 µm wide, K-. *Epihymenium* yellowish-olive. *Hymenium* hyaline, 60–110 µm high, I-, K/I-. *Hypothecium* brown, 20–50 µm high. *Paraphyses* filiform, 1.5(–2) µm diam., simple or very rarely branched, scarcely septate, with swollen, non-pigmented apices 2–4.5 µm diam. *Asci* elongate-clavate, with thickened apex, short-stalked, (43–)48–60(–72) × (11–)14–18(–20) µm (n = 38, in K/I), 8-spored, I-, K/I-. *Ascospores* narrowly fusiform to subcylindrical, rarely narrowly elliptic, symmetric, straight to occasionally slightly bent, hyaline, (1–)3(–7) septate [4–7 septa seen only in overmature spores], not or constricted at the septa, (14–)21.5–31(–36) × (3.5–)4–5(–6) µm, l/b = (2.8–)4.6–7.0(–8.0) (n = 121, in water or K/I), without perispore, usually with 1–2 big lipid drops in each cell, usually more or less collateral in an ascus. *Anamorph* not observed.

Ascospores	*C. peltigerae*	*C. fusispora*	*C. santessonii*	*C. chugachiana*
Shape	broadly to narrowly elliptic, symmetric or with one half thicker	narrowly fusiform to subcylindrical, rarely narrowly elliptic, symmetric	narrowly fusiform to subbacilliform	narrowly fusiform to subcylindrical
Septation	(1–)3(–5)	(1–)3(–7)	(1–)3	(3–)7(–8)
Size (µm)	(9–)15–20.5(–26) × (4–)5–6.5(–8.5)	(14–)21.5–31(–36) × (3.5–)4–5(–6)	(15–)17–22(–28) × 3–4	(22–)26–35(–45) × 3–4(–5)
Length/breadth ratio	(1.6–)2.5–3.7(–5.8)	(2.8–)4.6–7.0(–8.0)	(4.4–)5.3–7.3(–8.3)	(5.5–)6.8–10.0(–15.0)

Table 1. Distinguishing characteristics of *Corticifraga* species with pluriseptate ascospores compiled from Zhurbenko (2007a) and the present publication

Etymology. – After shape of ascospores.

Matrix and Biology. – Grows on upper side of lobes close to their margins of *Peltigera aphthosa* and *P. leucophlebia*. Causes local bleaching of the host thalli.

Distribution. – So far known from a few scattered finds in taiga and tundra zones of Eurasia. Evidently more rare than *Corticifraga peltigerae*.

Observations. – The new fungus belongs to the group of *Corticifraga* species with pluriseptate ascospores and thus readily differs from *C. fuckelii* and *C. pseudocyphellariae* Etayo with exclusively or mainly 1-septate ascospores (Etayo & Sancho 2008, Hawksworth & Santesson 1990). All species of the group so far known have discriminating ascospore characteristics (Table 1). Additionally *C. chugachiana* Zhurb. and *C. santessonii* Zhurb. & Zavarzin are known growing only from *Lobaria* and/or *Nephroma* and the former species also induces galls.

Additional Specimens Examined. All specimens on *Peltigera* spp. (on upper side of lobes close to their margins). – **RUSSIA. MURMANSK REGION:** Alakurtti, Tumcha River, 66°57'N, 30°24'E, *Pinus* forest, on *P. aphthosa*, 12.vii.1957, *R. Shlyakov* (LE 233886:a). **TAIMYR PEN.:** Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, on *P. aphthosa*, 4.ix.1995, *MZ 95426* (LE 233677). **YAKUTIYA:** Lena River delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, on *P. leucophlebia*, 1.viii.1998, *MZ 98401* (LE 261643).

25. *Corticifraga peltigerae* (Fuckel) D. Hawksw. & R. Sant.

Notes. – Ascospores hyaline, broadly to very narrowly elliptic, straight or occasionally somewhat bent, apices usually acute or occasionally rounded, sometimes attenuated, symmetric or with one half thicker, (1–)3(–5)-septate, not to often markedly constricted at the septa, (9–)15–20.5(–26) × (4–)5–6.5(–8.5) µm, l/b = (1.6–)2.5–3.7(–5.8) (n = 320) in specimens growing on *Peltigera* and (11.5–)14–19(–23) × (4–)4.5–6(–7) µm, l/b = (1.7–)2.5–4.1(–5.5) (n = 71) in the only specimen growing on *Pseudocyphellaria* (LE 261633). These measurements are in good agreement with those of Hawksworth & Santesson (1990). Causes bleaching of host tissues. Formerly just onespecies of *Corticifraga, C. pseudocyphellariae*, characterized by 1-septate, 12–15.5 × 3.5–4 µm ascospores, was known to occur on *Pseudocyphellaria* (Etayo & Sancho 2008). The species is new to Severnaya Zemlya, Wrangel' Is. and Kamchatka.

Specimens Examined. All specimens on *Peltigera* spp. (on upper, sometimes raised lower sides od lobes, occasionally soralia), unless otherwise indicated. – **U.S.A. ALASKA:** Prince of Wales Is., coast N of Thorne Bay, near Barren Creek mouth, 55°46'N, 132°29'W, alt. 2 m, *Tsuga heterophylla–Picea sitchensis* forest, on *Pseudocyphellaria crocata* (lobes, soralia), 9.viii. 2001, *MZ 0117* (LE 261633) (Plate 1, fig. 2). **RUSSIA. MURMANSK REGION:** Barents Sea coast, Dal'nie Zelentsy, 69°07'N, 36°05'E, alt. 20 m, dwarf shrub-moss-lichen tundra, on *P. scabrosa*, 22.viii.1997, *MZ 97362* (LE 233687); Khibiny Mts., Vud'yavrchorr Mt., 67°38'N, 33°39' E, alt. 500 m, *Betula* forest, on *P. polydactylon*-group, 18.ix.1960, *A. Dombrovskaya* (LE 233478); same mts., Kukisvumchorr Mt., 67°40'N, 33°41'E, alt. 350 m, stone field in *Betula* forest, on *P. didactyla*, 15.viii.1997, *MZ 97361* (LE 233598); alt. 800 m, mountain tundra, on *P. malacea*, 11.vi.1961, *A. Dombrovskaya* (LE 233668); same mts., Yuksporr Mt., 67°38'N, 33°45'E, alt. 800 m, mountain tundra, on *P. didactyla*, 23.vii.1966, *A. Dombrovskaya* (LE 233608). **NENETZ REGION:** Bol'shezemel'skaya Tundra, headwaters of Severnaya River, 67°38'N, 54°01'E, *Salix* tundra, on *P. didactyla*, 14.viii.1996, *O. Lavrinenko* (LE 233538). **SEVERNAYA ZEMLYA** (arctic desert): Oktyabr'skoi Revolutsii Is., Serp

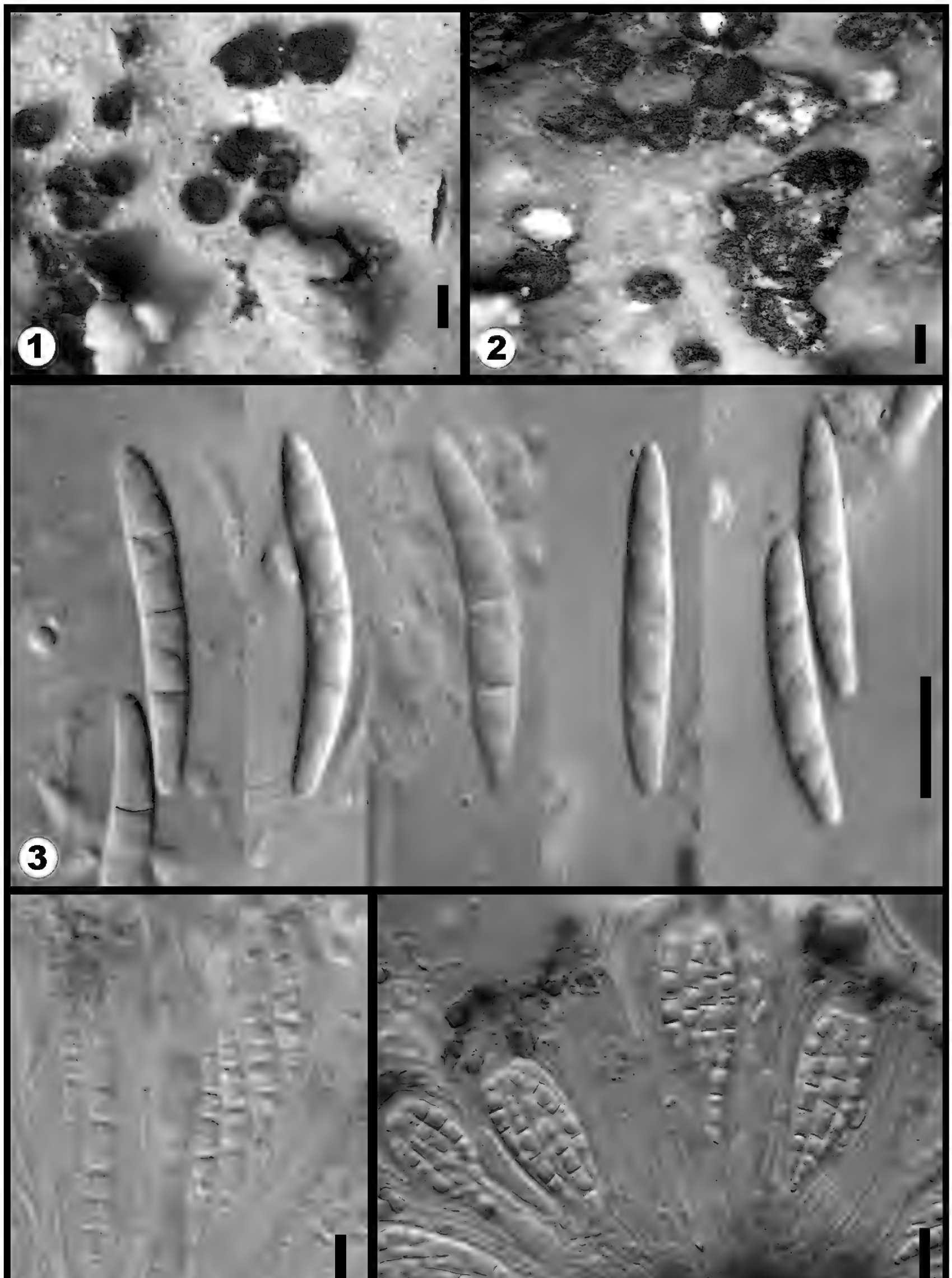


Plate 1. *Corticifraga fusispora* and *C. peltigerae*. Figure 1, habitus of *C. fusispora* (scale = 0.2 mm). Figure 2, habitus of *C. peltigerae* on *Pseudocyphellaria* (scale = 0.2 mm). Figure 3, ascospores of *C. fusispora* in water (scale = 10 µm). Figure 4, over-mature ascospores of *C. fusispora* in KI (scale = 10 µm). Figure 5, asci of *C. fusispora* in K (scale = 20 µm).

i Molot Mt., 79°45'N, 94°11'E, on *P. canina*, 17.vii.1985, *M. Gavrilo* (LE 233498). Bol'shevik Is., middle Studenaya River, 78°37'N, 101°05'E, alt. 130 m, on *P. canina*, 14.viii.1998, *N. Matveeva* (LE 233976); on *P.* sp., 16.viii.1998, *N. Matveeva* (LE 233905). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200–300 m, stony tundra, on *P. rufescens*, 22.vii.1995, *MZ 95424* (LE 233428); on *P. canina*, 30.viii.1995, *MZ 95466* (LE 233994); W of Levinson-Lessinga Lake, 74°30'N, 98°30'E, alt. 120 m, rocks in tundra, on *P. rufescens*, 27.viii.1995, *MZ 95455* (LE 233936); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 120 m, rocks in tundra, on *P. rufescens*, 28.viii.1995, *MZ 95452* (LE 233796); Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, on *P. malacea*, 4.ix.1995, *MZ 95427* (LE 233697); on *P. canina*, 4.ix.1995, *MZ 95425* (LE 233678). **YAKUTIYA:** Lena River delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, on *P. occidentalis*, 1.viii.1998, *MZ 98346:b* (LE 233855:b); on *P. leucophlebia*, 8.viii.1998, *MZ 98336:b* (LE 233956:b); on *P. scabrosa*, 8.viii.1998, *MZ 98341* (LE 233875); same delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, *Dryas* tundra, on *P. extenuata*, 27.vii.1998, *MZ 98339* (LE 233786); lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, on *P. canina*, 4.viii.1998, *MZ 98340* (LE 233856); Indigirka River, 8 km NNE of Ust'-Nera, 64°38'N, 143°20'E, alt. 500 m, stony *Larix* forest, on *P. rufescens*, 13.vii.1992, *MZ 92558* (LE 233648); junction of Indigirka and Ystan-Yuryakh Rivers, *Larix* forest, on *P. rufescens*, 8.vii.1976, *I. Makarova* (LE 233925). **WRANGEL' IS.:** Neizvestnaya River, 71°20'N, 179°30'W, spotty moss-*Carex-Dryas* tundra, on *P. canina*, 1996, *S. Kholod* (LE 233896). **CHUKOTKA:** Baranikha, 68°30'N, 168°16'E, tundra, on *P. rufescens*, 4.vii.1971, *A. Galanin* (LE 233726). Chegitun' River mouth, 66°30'N, 171°05'W, *Dryas* tundra, on *P. rufescens*, 12.viii.1971, *B. Yurtsev* (LE 233866); Ioni Lake, 65°53'N, 173°44'W, boggy shrub tundra, on *P. extenuata*, 27.vi.1977, *I. Makarova* (LE 233986). **KAMCHATKA:** Esso, 55°55'N, 158°42'E, alt. 500 m, *Larix* forest, on *P. scabrosa*, 26.vii.1983, *A. Dombrovskaya* (LE 233915).

26. *Dacampia engeliana* (Saut.) A. Massal.

Notes. – Ascospores elliptic to narrowly elliptic, with 3(–5) transsepta and 1 longitudinal or oblique septum in central segments, usually markedly constricted at the septa, (16–)19.5–24.5(–30) × (8–)8.5–10(–11) µm, l/b = (1.6–)2.1–2.7(–3.1) (n = 86). Infected tissues of *Solorina* spp. become grey and often swollen around perithecia of the parasite, a feature that is never observed in *Pyrenidium actinellum* infections on the same hosts. New to Nenetz Region, Severnaya Zemlya, Yakutiya and Chukotka. *Solorina bispora* is probably a new host species.

Specimens Examined. All specimens on *Solorina* spp. – **RUSSIA. NORTHERN URAL:** junction of Pechora and Shezhim Rivers, 62°05'N, 58°25'E, alt. 200 m, carbonate rocks in spruce forest, on *S. saccata* (upper side of decaying lobes), 7.vii.1997, *MZ 97281* (LE 233742). **NENETZ REGION:** Malozemel'skaya Tundra, Seduiyakha River, 68°23'N, 53°15'E, *Betula nana*-moss tundra, on *S. saccata* (lobes), 3.viii.1998, *O. Lavrinenko* (LE 233882). **SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 20 m, arctic desert, on *S. saccata* (decaying lobe portions), 17.vii.1996, *MZ 96969* (LE 233902); on *S. bispora* (decaying lobes), 17.vii.1996, *MZ 96966* (LE 233773). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 50–250 m, carbonate rocks in tundra, on *S. saccata* (upper lobe side), 20.viii.1995, *MZ 95476* (LE 233893); tundra, on *S. bispora* (lobes), 25.viii.1995, *MZ 95478* (LE 233823). **YAKUTIYA:** lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt. 50 m, spotty *Dryas* tundra, on *S. bispora* (decaying lobes), 4.viii.1998, *MZ 98370* (LE 260279). **CHUKOTKA:** Gil'mymlineiveem River, 65°48'N, 173°15'E, tundra, on *S. saccata* (upper lobe side), 20.vii.1977, *I. Makarova* (LE 233752:b) [rev. D. Triebel, 2004].

27. *Dacampia rufescentis* (Vouaux) D. Hawksw.

Notes. – Pathogenic. New to Asia. *Peltigera lepidophora* is a new host species.

Specimens Examined. All specimens on *Peltigera* spp. – **CANADA. NORTHWEST TERRITORIES:** Daring Lake, 64°52'N, 111°35'W, dwarf shrub-lichen tundra, on *P. rufescens* (upper lobe side), 10.viii.1999, *N. Matveeva* (LE 233858). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200 m, stony tundra, on *P.* sp. (decaying th.: upper side), 22.vii.1995, *MZ 95443* (LE 233848); on *P. rufescens* (decaying th.: upper side), 22.vii.1995, *MZ 95446* (LE 233828). **CHUKOTKA:** Baranikha, 68°30'N, 168°16'E, tundra, on *P.* sp. (dead th.), 16.vi.1971, *I. Makarova* (LE 233898); Bezymyannoe Lake, 66°39'N, 176°40'E, dwarf shrub tundra, on *P. lepidophora* (th.: upper lobe side), 7.vii.1979, *I. Makarova* (LE 233768).

28. *Dactylospora amygdalariae* Triebel

Specimen Examined. – **U.S.A. ALASKA:** Seward Peninsula, Bering Land Bridge National Preserve, 65°50'N, 164°33'W, alt. 670 m, alpine barren, on *Amygdalaria elegantior* (th., cephalodia), 15.vii.2002, *J. Roth* (LE 260043).

29. *Dactylospora deminuta* (Th. Fr.) Triebel s.l.

Syn. nov.: *Dactylospora rinodinicola* Alstrup & D. Hawksw., Meddelelser om Grønland, Bioscience 31: 25 (1990). TYPE: Groenlandia, Ivigtut d., Ivigtut town, 61°12'N, alt. 350 m, on apothecia and thalli of *Rinodina turfacea* (Wahlenb.) Körb. growing on dead plant remains, 10.vii.1946, *S. Christiansen 5523* (C, holotype).

NOTES. – According to the protologue of *Dactylospora rinodinicola* (Alstrup & Hawksworth 1990: 25), its diagnostic features are (1–)3–4(–6)-septate ascospores, (15.5–)17–20(–24.5) × (4.5–)5–6.5 µm, apothecia (0.1–)0.15–0.2 mm diam., and occurrence on *Rinodina*, mostly on the apothecia of the host. We have examined eleven specimens of *Dactylospora* on *Rinodina*, which all fit concept of *D. rinodinicola*, viz. ascospores 3–7-septate, (13–)17–24(–28) × 5–7 µm, l/b = (2.2–)2.9–3.5–4.1(–5.4) (n = 79), often growing on both thalli and apothecia of the host. However, these specimens are indistinguishable from *D. deminuta* s. l., which proved to be a variable species with respect to ascospore size and septation, colonizing a wide range of host taxa. For instance, individuals on *Lecanora epibryon* had olive then (orange) brown, (1–)3–5(–7) transseptate ascospores, (8–)14–20(–24) × (4.5–)5–6(–7) µm, l/b = (1.1–)2.4–3.6(–4.8) (n = 219). It is noteworthy, that evidently the same populations of *Dactylospora deminuta* were sometimes found on different adjacent host lichens. Pathogenicity never observed. New to Nenetz Region. *Caloplaca, Fuscopannaria, Lecidoma* and *Solorina* are new host genera, *Lecanora geophila* is a new host species.

SPECIMENS EXAMINED. – **U.S.A. ALASKA:** Barrow, 71°19'N, 156°37'W, graminoid-moss-lichen tundra, on *Protopannaria pezizoides* (moribund th., ap.), 2.vii.1999, *D. Walker* (LE 260286); Alaska Range, Denali National Park Wilderness, headwaters of Hinnes Creek, 63°44'N, 149°07'W, alt. 1200 m, *Dryas*-moss-lichen mountain tundra, on *Fuscopannaria viridescens* (th.), 30.viii.2000, *MZ 00315* (LE 260148); Kobuk Valley Wilderness, 67°07'N, 159°03'W, alt. 40 m, mixed forest, on *Solorina bispora* (th.), 9.viii.2000, *MZ 00198:b* (LE 260256:b). **CANADA. NUNAVUT:** Axel Heiberg Is., Bunde Fjord, 80°30'N, 94°35'W, *Dryas* tundra, on *Lecanora epibryon* (ap.: hymenium), 1.viii.1999, *N. Matveeva* (LE 261746:b). **NORWAY. SVALBARD:** Nordenskiöld Land, E coast of Grønfjorden, 4 km S of Barentsburg, 78°02'N, 14°19'E, alt. 20 m, spotty dwarf shrub-lichen-moss tundra, on *P. pezizoides* (th.), 13.vii.2003, *MZ 03172:b* (LE 260215:b). **RUSSIA. MURMANSK REGION:** Kovdor, 67°32'N, 30°30'E, on mossy rock in *Betula* forest, on *P. pezizoides* (moribund portions of th. and ap.), 13.vii.1977, *A. Dombrovskaya* (LE 260287). **FRANZ JOSEF LAND:** Hooker Is., Tikhaya Bay, 80°20'N, 52°52'E, arctic desert, on *Rinodina turfacea* (th.), 15.viii.1979, *I. Safronova* (LE 261740). **NENETZ REGION:** Malozemel'skaya Tundra, Seduiyakha River, 68°23'N, 53°15'E, dwarf shrub-lichen tundra, on *L. epibryon* (th.), 3.viii.1998, *O. Lavrinenko* (LE 261526); Bol'shezemel'skaya Tundra, Cape Bolvanskii Nos, 68°18'N, 54°30'E, dwarf shrub tundra, on *L. epibryon* (th.), 18.vii.1999, *O. Lavrinenko* (LE 261576:a); 24.vii.1999, *O. Lavrinenko* (LE 261676). **POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°39'E, alt. 250 m, boulders in sparse *Larix* forest, on *R. turfacea* (ap.: hymenium; th.), 27.vi.1993, *MZ 93146* (LE 260261). **SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, on *L. epibryon* (th.), 10.vii. 1996, *MZ 961011* (LE 261616); on *P. pezizoides* (moribund th.), 12.vii.1996, *MZ 96994:a* (LE 260227:a); on *L. geophila* (th.), 13.vii.1996, *MZ 961010:b* (LE 261707:b); same is., between Shokal'skogo Strait and Mikoyana Bay, 79°17'N, 101°50'E, alt. 40 m, on *P. pezizoides* (moribund portions of th. and ap.), 20.vii.1996, *MZ 96839* (LE 260297); same is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 20 m, on *L. epibryon* (th.), 21.vii.1996, *MZ 961012* (LE 261556); same is., Ostantsovaya River, 79°13'N, 102°02'E, alt. 60 m, on *Lecidoma demissum* (th.), 12.vii.1996, *MZ 96127* (LE 207639); same is., W coast of Akhmatova Bay, 79°04'N, 102°41–45'E, alt. 5–40 m, on *L. epibryon* (ap., th.), 15.vii.1996, *MZ 961015* (LE 261586); 17.vii. 1996, *MZ 961013* (LE 261656); *MZ 961014* (LE 261646); on *L. geophila* (th.), 17.vii.1996, *MZ 961009* (LE 261756); on *Psoroma hypnorum* (th.), 18.vii.1996, *MZ 96990* (LE 260238); same is., middle Studenaya River, 78°37'N, 101°05'E, alt. 130 m, on *R. turfacea* (th., ap.: hymenium), 16.viii.1998, *N. Matveeva* (LE 260272, LE 260061); same river, on *L. epibryon* (th.), 16.viii. 1998, *N. Matveeva* (LE 261685); same is., middle Golysheva River, 78°26'N, 104°28'E, alt. 170 m, on *Micarea incrassata* (th.), 4.viii.2000, *N. Matveeva* (LE 260206:b); same is., Cape Antseva, 78°12'N, 103°17'E, alt. 30 m, on *P. pezizoides* (moribund th.), 7.viii.1997, *N. Matveeva* (LE 260217); 21.viii.1998, *N. Matveeva* (LE 260196:b). **TAIMYR PEN.:** NW coast of Pyasino Lake, N'yapan hills, 70°00'N, 87°30'E, alt. 50–100 m, shrub tundra, on *L. epibryon* (th.), 17.vii.1983, *MZ* 8358 (LE 261516); alt. 100 m, 24.vii.1983, *MZ* 83233 (LE 261686); 26.vii.1999, *L. Zanokha* (LE 261726). Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 100–500 m, rocks in tundra, on *L. epibryon* (ap., th.), 27.vii.1994, *MZ 9461* (LE 261565); wet stony tundra, on *L. geophila* (th.), 21.vii.1995, *MZ 95547* (LE 261547); 20.viii.1995, *MZ 95548* (LE 261697); stony tundra, on *R. turfacea* (ap.: hymenium), 22.vii.1995, *MZ 95516* (LE 260111); pebbly *Dryas* tundra, on *R. mniaraea* (th.), 26.viii.1995, *MZ 95519* (LE 261680); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 50–250 m, rocks in tundra, on *Lecidoma demissum* (th.), 28.vii.1995, *MZ 95507* (LE 260106); on *P. pezizoides* (th.), 30.vii.1995, *MZ 95504* (LE 260237); tundra, on *L. epibryon* (th.), 31.vii.1995, *MZ 95556* (LE 261776); 1.viii.1995, *MZ 95555* (LE 261626); Khatanga Bay, Cape Kosistyi, 73°39'N, 109°43'E, arctic tundra, on *P. pezizoides* (moribund th. and ap.), 7.viii.1996, *I. Kirtsideli* (LE 260257); on *R. mniaraea* (th.), 7.viii.1996, *I. Kirtsideli* (LE 260231). **PUTORANA PLATEAU:** Kapchuk Lake, 69°29'N, 91°00'E, alt. 1000 m, mountain tundra, on *P. pezizoides* (th., ap.), 13.viii.1983, *MZ 83230* (LE 260116). **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Khas-Khatyn-Dzhiete cabin, 72°50'N, 126°15'E, alt. 5 m, tundra, on *L. epibryon* (th.), 16.viii.1987, *V. Perfil'eva* (LE 261546); same delta, Olenek Channel, Novyi Chai-Tumus cabin, 72°20'N, 125°40'E, alt. 20 m, dwarf shrub tundra, on *P. pezizoides* (th.), 6.viii.1998, *MZ 98385* (LE 260065); lower Lena River, NW extremity of Primorskii Range, Stolb meteostation,

72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, on *L. epibryon* (th., ap.: margins), 4.viii.1998, *MZ 98397* (LE 261666); 14.viii. 1987, *V. Perfil'eva* (LE 261566); Laptevykh Sea coast, 1 km S of Tiksi, 71°37'N, 128°54'E, alt. 70 m, dwarf shrub tundra, on *R. turfacea* (th., ap.: hymenium), 18.vii.1998, *MZ 98156* (LE 260212); on *Caloplaca tetraspora* (th., rarely ap.), 18.vii.1998, *MZ 98389* (LE 261710). **WRANGEL' IS.:** Tundrovaya River, 71°30'N, 179°45'W, mossy tundra, on *R. mniaraea* (th., ap.: hymenium), 9 VIII 1996, *S. Kholod* (LE 261770); on *P. pezizoides* (th.), 22 VIII 1996, *S. Kholod* (LE 260275); Neizvestnaya River, 71°20'N, 179°30'W, spotty moss-*Carex-Dryas* tundra, on *L. epibryon* (th.), 3 IX 1996, *S. Kholod* (LE 261706); middle Neizvestnaya River, 71°21'N, 179°34'W, *Dryas* tundra, on *Psoroma tenue* var. *boreale* (th.), 26.vii.1987, *B. Yurtsev* (LE 260198). **CHUKOTKA:** Egvekinot, 66°20'N, 179°07'W, dwarf shrub tundra, on *R. turfacea* (th.), 26.vii.1970, *I. Makarova* (LE 260292); Iskaten' Range, 66°35'N, 179°10'W, on *L. epibryon* (th., ap.), 10.viii.1971, *B. Yurtsev* (LE 261665); junction of Erguveem and Pepenveem Rivers, 65°55'N, 175°50'W, dwarf shrub tundra, on *L. epibryon* (th., ap.: margins), 9.vii.1970, *A. Galanin* (LE 261716); 14.viii.1970, *A. Galanin* (LE 261696); E coast of Kolyuchin Inlet, Yuniveem River basin, 66°40'N, 173°54'W, tundra, on *Psoroma hypnorum* (th.), 21.viii.1980, *A. Katenin* (LE 260118); Penkignei Bay, Pestsovaya River mouth, 64°50'N, 173°10'W, dwarf shrub tundra, on *L. epibryon* (th.), 13.viii.1978, *A. Katenin* (LE 261606); Enurmino, 66°56'N, 171°49'W, tundra, on *P. pezizoides* (th., occasionally ap.), 27.vii.1972, *I. Makarova* (LE 260035); Lavrentiya Bay, 65°35'N, 171°00'W, dwarf shrub tundra, on *R. turfacea* (th., ap.: hymenium), 10.vii.1973, *I. Makarova* (LE 260151); Puoten Bay, 65°50'N, 170°30'W, dwarf shrub tundra, on *L. epibryon* (th.), 21.vii.1972, *I. Makarova* (LE 261506:a); Inchoun, 66°15'N, 170°20'W, dwarf shrub tundra, on *L. epibryon* (th.), 9.viii.1975, *I. Makarova* (LE 261596); Anadyr' Bay, lower Kurupka River, 64°45'N, 174°05'W, dwarf shrub tundra, on *L. epibryon* (th.), 2.viii.1987, *A. Katenin* (LE 261636).

30. *Dactylospora glaucomarioides* (Tuck.) Hafellner

Notes. – Apothecia 0.2–0.8 mm diam. Hypothecium with K+ blue-green granules. Ascospores (1–)3(–6)-septate, (11–)13.5–19(–24) × (5–)5.5–6.5(–8) µm, l/b = (1.8–)2.1–3.3(–4.8) (n = 22, in water or KOH). Infected host tissues partly slightly damaged.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, rocks in tundra, on *Megaspora verrucosa* (th., ap.), 29.vii.1994, *MZ 9428:a* (LE 207613:a).

31. *Dactylospora homoclinella* (Nyl.) Hafellner

Notes. – Pathogenicity not observed. New to Asian Russia and the Arctic. *Lecanora argentea* is a new host species.

Specimen Examined. – **RUSSIA. CHUKOTKA:** Televeem River, 65°50'N, 175°05'E, boulders in tundra, on *Lecanora argentea* (th., occasionally discs of ap.), 23.vii.1979, *I. Makarova* (LE 261555).

32. *Didymellopsis latitans* (Nyl.) Clem. et Shear.

Notes. – The specimen fits the species description (Grube & Hafellner 1990), except the host affiliation – it was formerly known only on members of Lichinales, while *Biatorella* belongs to Lecanorales. Pathogenicity not observed. New to North America and the Arctic.

Specimen Examined. – **U.S.A. ALASKA:** North Slope, Sagwon, 69°26'N, 148°40'W, alt. 275 m, lichen crusts on frost boil, on *Biatorella contigua* (th.), 7.viii.2003, *D. Walker* (LE 260183).

33. *Endococcus perpusillus* Nyl. s.l.

Notes. – Distinction of the species from *Endococcus rugulosus* follows Triebel (1989), but is sometimes uncertain, particularly with respect to length/breadth index. Ascospores pale to medium olive(-brown), mainly elliptic to narrowly elliptic, (14–)16–21(–28) × (5.5–)6.5–8(–9) µm, l/b = (1.8–)2.1–2.9(–3.5) (n = 132). Pathogenicity usually not observed, but sometimes heavily infected host areoles become swollen or slightly paler. New to Polar Ural, Yakutiya, Wrangel' Is. and Chukotka.

Specimens Examined. All specimens on *Rhizocarpon* spp. – **RUSSIA. POLAR URAL:** Sob' River, 66°59'N, 65°45'E, alt. 300 m, boulders in subalpine belt, on *R. geographicum* (th.), 17.vii.1986, *MZ 86133* (LE 261669); 24.vii.1986, *MZ 86170* (LE 261670). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200 m, rocks in tundra, on *R. geographicum* (th.), 26.viii.1995, *MZ 95521* (LE 261550). **YAKUTIYA:** lower Lena River, N of Kharaulakh Range, Bulunkan-Khayata Mt., 72°17'N, 127°45'E, alt. 140 m, scree tundra, on *R. geographicum* (th.), 23.vii.1988, *I. Makarova* (LE

261529:a). **WRANGEL' IS.:** Gusinaya River, 71°07'N, 179°18'E., alt. 80 m, scree tundra, on *R. eupetraeoides* (th.), 24.viii. 1991, *V. Shtrik* (LE 260264). **CHUKOTKA:** Enmyvaam River, 68°15'N, 166°03'E, stony tundra, on *R. geographicum* (th.), 3.vii.1980, *I. Makarova* (LE 261780); 10.vii.1980, *I. Makarova* (LE 261520); Lunnaya River at 115 km of the road Egvekinot-Iul'tin, 67°05'N, 178°47'W, stony tundra, on *R. eupetraeoides* (th.), 26.vii.1970, *I. Makarova* (LE 261799); Egvekinot, 66°20'N, 179°07'W, stony dwarf shrub tundra, on *R. geographicum* (th.), 21.vi.1970, *I. Makarova* (LE 261729); on *R. eupetraeoides* (th.), 21.vi.1970, *I. Makarova* (LE 261539); 25.vi.1970, *I. Makarova* (LE 261539).

34. *Endococcus propinquus* (Körb.) D. Hawksw.

NOTE. – Pathogenicity not observed.

SPECIMEN EXAMINED. – **RUSSIA. CHUKOTKA:** lower Kymyneiveem River, 67°26'N, 175°25'W, rocky slope, on *Porpidia flavicunda* (th.), 30.vii.1989, *A. Katenin* (LE 261789:a).

35. *Endococcus rugulosus* Nyl. s.l.

NOTES. – Identification followed the species concept of Triebel (1989), though examined specimens had some discrepancies with it. Perithecia 150–250 µm diam. Ascospores pale to dark olive to brown, mainly elliptic, ends rounded to occasionally rather acute, with smooth wall about 1 µm thick, (0–)1-septate, not or occasionally markedly constricted at the septum, rarely with small papilla at one end, (7–)12.5–16(–18) × (3–)6.5–8.5(–10) µm, l/b = (1.3–)1.6–2.2(–3.6) (n = 152). In some specimens (LE 261589, 261519, 261679:a) ascospores are pale with darker and sometimes rather acute ends and darker septa, which is characteristic of *Endococcus perpusillus* according to Triebel (1989: 94). Heavily infected host areoles sometimes become swollen, otherwise pathogenicity not observed. New to Polar Ural. *Rhizocarpon sorediosum* is a new host species.

SPECIMENS EXAMINED. All specimens on thallus and often prothallus of *Rhizocarpon* spp. – **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°39'E, alt. 150 m, rocks in *Larix* forest, on *R. geminatum*, 27.vi.1993, *MZ 93110:b* (LE 261709:b). **CHUKOTKA:** Iskaten' Range, 66°35'N, 179°10'W, boulders in tundra, on *R. geographicum*, 1.vii.1971, *I. Makarova* (LE 261719); Egvekinot, 66°20'N, 179°07'W, stony dwarf shrub tundra, on *R. sorediosum*, 1970, *I. Makarova* (LE 261660); Inchoun, 66°15'N, 170°20'W, stony tundra, on *R. eupetraeoides*, 29.vii.1975, *I. Makarova* (LE 261589, LE 261519, LE 261679:a); lower Kymyneiveem River, 67°26'N, 175°25'W, rocky slope, on *R. eupetraeoides*, 30.vii.1989, *A. Katenin* (LE 261789:b).

36. *Epibryon conductrix* (Norman) Nik. Hoffm. & Hafellner

NOTES. – Pathogenicity not observed. New to Taimyr Pen.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** lower Pravaya Uboinaya River, "217" Mt., 73°26'N, 82°43'E, alt. 150 m, stony dwarf shrub tundra, on *Catapyrenium daedaleum* (th.), 5.viii.1990, *MZ* 90560 (LE 260163).

37. *Epibryon solorinae* (Vain.) Nik. Hoffm. & Hafellner

NOTES. – Infected host tissues sometimes bleached. New to Russia, Asia and Arctic.

SPECIMENS EXAMINED. All specimens on *Solorina* spp. – **RUSSIA. YAKUTIYA:** Lena River delta, Olenek Channel, Novyi Chai-Tumus cabin, 72°20'N, 125°40'E, alt. 20 m, dwarf shrub tundra, on *S. bispora* var. *subspongiosa* (old lobes), 6.viii. 1998, *MZ* 98374 (LE 260270); lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, on *S. saccata* (decaying lobes), 4.viii.1998, *MZ* 98369 (LE 260190). **CHUKOTKA:** Inchoun, 66°15'N, 170°20'W, tundra, on *S. bispora* (ap.: hymenium; th.), 7.viii.1975, *I. Makarova* (LE 233922); Lavrentiya Bay, 65°35'N, 171°00'W, dwarf shrub tundra, on *S. bispora* (th.), 23.vii.1973, *I. Makarova* (LE 233762).

38. *Everniicola flexispora* D. Hawksw.

NOTES. – Causes bleached spots with dark rim. New to South Siberia.

SPECIMENS EXAMINED. All specimens on *Nephroma arcticum* (th.). – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Olenka River mouth, 69°02'N, 36°25'E, alt. 20 m, shrub tundra, 7.ix.1997, *MZ 97360* (LE 233638). **SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°25–31'E, alt. 1500 m, above shaded rocks in sparse *Pinus sibirica-Abies sibirica* forest, 5.vii.2009, *MZ 0923* (LE 260101); 24.vii.2009, *MZ 0924* (LE 260122).

39. *Graphium aphthosae* Alstrup & D. Hawksw.

NOTES. – In the species protologue conidia were reported 7.5 × 3.5–4 µm (Alstrup & Hawksworth 1990). In the material I examined they were (6–)8–10(–11) × (3–)3.5–4(–4.5) µm, l/b = (1.7–)2.1–3.9(–3.2) (n = 60), elongate cuneiform with truncated base and rounded apex, hyaline to pale olivaceous buff. This is the second report of the species from *Solorina* after Alstrup (2004), otherwise it is restricted to *Peltigera*. New to Svalbard, Yamal-Gydan Region, Severnaya Zemlya, Taimyr Pen., Sayan Mts., and Chukotka. *Peltigera venosa* is a new host species.

SPECIMENS EXAMINED. All specimens on *Peltigera*, unless otherwise indicated, on upper side of decaying host lobes. – **NORWAY. SVALBARD:** Belsund Bay, Aldegondabergen Mt., alt. 75 m, dwarf shrub-moss tundra, on *P. leucophlebia*, 20.vii. 1991, *N. Koroleva* (LE 233528). **RUSSIA. MURMANSK REGION:** Tuloma River, Padun, 68°35'N, 31°50'E, *Pinus* forest, on *P. aphthosa*, 30.viii.1971, *A. Dombrovskaya* (LE 233895:c); Alakurtti, Tumcha River, 66°57'N, 30°24'E, *Pinus* forest, on *P. aphthosa*, 12.vii.1957, *R. Shlyakov* (LE 233886:b); Pyukhyakuru River, 66°47'N, 30°00'E, alt. 240 m, rocks in *Betula* forest, on *P. venosa*, 1.vii.1972, *A. Dombrovskaya* (LE 260130:a). **GYDAN PEN.:** Eniseyskii Gulf coast, Leskino, 72°20'N, 79°30'E, tundra, on *P. leucophlebia*, 15.viii.1972, *R. Yunak & G. Prokop'eva* (LE 233716:b). **SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°03–04'N, 102°41–42'E, alt. 40–50 m, arctic desert, on *P. leucophlebia*, 16.vii.1996, *MZ 96949* (LE 233824); 18.vii.1996, *MZ 96948:a* (LE 233864:a). **TAIMYR PEN.:** Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, on *P. leucophlebia*, 4.ix.1995, *MZ 95439:a* (LE 233928:a). **SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°27–30'E, alt. 1500 m, sparse *Pinus sibirica-Abies sibirica* forest, on *P. leucophlebia*, 6.vii.2009, *MZ 0914* (LE 260082); open rocks near upper tree limit, on *Solorina bispora* (decaying lobe portions), 24.vii.2009, *MZ 0915* (LE 260093). **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Khas-Khatyn-Dzhiete cabin, 72°50'N, 126°15'E, alt. 5 m, polygonal tundra, on *P. leucophlebia*, 16.viii.1987, *V. Perfil'eva* (LE 233878). **CHUKOTKA:** Anadyr' Bay, lower Kurupka River, 64°45'N, 174°05'W, tundra, 31.vii.1987, on *P. leucophlebia*, *A. Katenin* (LE 233868).

40. *Hobsoniopsis santessonii* (Lowen & D. Hawksw.) D. Hawksw.

NOTES. – Sometimes causes weak swelling and discoloration of infected host parts. New to Russia, Asia and Arctic.

SPECIMENS EXAMINED. All specimens on healthy-looking lobes of *Peltigera scabrosa*. – **RUSSIA. MURMANSK REGION:** Lavnatundra Mt., 68°28'N, 30°00'E, forested canyon, 7.viii.1987, *T. Dudoreva* (LE 233807); Kanevka, 67°08'N, 39°38'E, alt. 230 m, *Betula nana*-lichen wet tundra, 20.viii.1967, *A. Dombrovskaya* (LE 233787). **CHUKOTKA:** Bezymyannoe Lake, 66°39'N, 176°40'E, dwarf shrub tundra, 5.vii.1979, *I. Makarova* (LE 233797).

41. *Illosporium carneum* Fr.

NOTES. – Sporodochia flesh pink. Usually growing on old/decaying thalli, including soralia, sometimes causes local bleaching of host tissues. New to Canadian Arctic, Putorana Plateau, Yakutiya and Sakhalin. *Peltigera aphthosa* is a new host species.

SPECIMENS EXAMINED. All specimens on *Peltigera* spp. – **CANADA. NUNAVUT:** Cornwallis Is., Resolute Bay, 74°42'N, 94°54'W, *Salix arctica-Saxifraga oppositifolia*-moss tundra, on *P. rufescens* (th.), 6.viii.1999, *N. Matveeva* (LE 233887). **RUSSIA. MURMANSK REGION:** Pasvik Reserve, Paz River, 69°08'N, 29°15'E, *Populus tremula* forest, on *P. extenuata*, 28.vii.1994, *V. Kostina* (LE 233727); Khibiny Mts., Vud'yavrchorr Mt., 67°41'N, 33°36'E, alt. 400 m, on *P. leucophlebia*, 10.viii.1960, *A. Dombrovskaya* (LE 233717); same mts., Kukisvumchorr Mt., 67°40'N, 33°41'E, alt. 350 m, stone field in *Betula* forest, on *P. extenuata*, 15.viii.1997, *MZ 97364* (LE 233707); Kanevka, 67°08'N, 39°38'E, *Betula* forest, on *P. extenuata*, 15.vii.1990, *T. Dudoreva* (LE 233897); Chapoma River, 66°15'N, 38°50'E, *Betula* forest, on *P. extenuata*, 19.viii. 1990, *T. Dudoreva* (LE 233937). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, stony tundra, on *P. aphthosa*, 30.viii.1995, *MZ 95463* (LE 233934); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 120 m, rocks in tundra, on *P. rufescens*, 28.viii.1995, *MZ 95453* (LE 233966). **PUTORANA PLATEAU:** Kapchuk Lake, Nikita-Yuryakh River mouth, 69°28'N, 91°02'E, *Salix* shrubs, on *P.* sp. (th.), 6.viii.1983, *MZ 83229* (LE 233757). **YAKUTIYA:** Lena River delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, *Dryas* tundra, on *P. leucophlebia*, 27.vii.1998, *MZ 98333* (LE 233907); same delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, on *P. rufescens*, 1.viii.1998, *MZ 98334* (LE 233777); Laptevykh Sea coast, 3 km NW of Tiksi, 71°39'N, 128°45'E, alt. 70 m, dwarf shrub tundra, on *P. rufescens*, 24.viii.1998, *MZ 98349* (LE 233804). **SAKHALIN IS.:** Bol'shevik Mt. just E of Yuzhno-Sakhalinsk, 46°56'N, 142°46'E, alt. 500 m, sparse *Betula paraermanii* forest, on *P. rufescens*, 1996, *A. Dobrysh* (LE 233737).

42. *Lasiosphaeriopsis salisburyi* D. Hawksw. & Sivan.

Notes. – Ascospores elliptic to narrowly elliptic, apices usually more or less attenuated, pale to medium yellowish brown, (1–)3-transseptate, distinctly constricted at median septum, terminal cells concolorous or occasionally paler [according to Hawksworth (1980) they should be consistently subhyaline], mostly symmetric, slightly to markedly constricted at the septa, (21–)28.5–37(–40) × (8–)9–11(–12), l/b = (1.9–)2.8–4.0(–5.0) (n = 38 in water or KOH), often with big lipid drops, smooth-walled, non-halonate, K+ olive. Growing on the underside of old host lobes by their margins. The first verified report from Russia, where it is new to Yakutuya and Chukotka. New to Asia and the Arctic.

Specimens Examined. – **RUSSIA. YAKUTIYA:** Lena River delta, Olenek Channel, Novyi Chai-Tumus cabin, 72°20'N, 125°40'E, alt. 20 m, dwarf shrub tundra, on *Peltigera* sp., 6.viii.1998, *MZ 98325* (LE 233758). **CHUKOTKA:** Pineiveem River, 68°35′N, 169°30′E, on *P. rufescens*, 30.vii.1982, *T. Polozova* (LE 233808).

43. *Lichenochora coppinsii* Etayo & Nav.-Ros.

Notes. – Ascospores hyaline, fusiform, gradually tapering towards apices, (26–)38–56(–62) × (5–)6–7.5(–8) µm, l/b = (4.1–)5.8–8.8(–10.0) (n = 38), (1–)3–9(–12)-septate, 2–4 per ascus. In the protologue ascospores were reported to be 50–75 × 5.5–6 µm, 3–9 septate (Etayo & Navarro-Rosinés 2008). Pathogenicity not observed. This recently described species was formally known only from the type locality in Scotland and is new to Russia, Asia and Arctic.

Specimens Examined. All specimens on thalli and prothalli of *Protopannaria pezizoides*. – **RUSSIA. SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, 12.vii.1996, *MZ 961003* (LE 261583); 15.vii.1996, *MZ 96573* (LE 261523); same is., between Shokal'skogo Strait and Mikoyana Bay, 79°17'N, 101°50'E, alt. 40 m, 20.vii.1996, *MZ 961017* (LE 261763); same is., Cape Antseva, 78°12'N, 103°17'E, alt. 30 m, wet *Phippsia algida* vegetation, 23.vii.2000, *N. Matveeva* (LE 261563). **TAIMYR PEN.:** Uboinaya River mouth, 73°36'N, 82°22'E, alt. 20 m, spotty dwarf shrub-lichen-moss tundra, 1.viii.1990, *MZ 90706* (LE 261733); 3.viii.1990, *MZ 90723* (LE 261703); Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 20 m, nival tundra, 13.vii.1990, *MZ 90698* (LE 261513); Byrranga Mts., NW of Levinson-Lessinga Lake, 74°31'N, 98°27'E, alt. 450 m, scree tundra, 10.viii.1995, *MZ 95506* (LE 260135). **CHUKOTKA:** Televeem River, 65°50'N, 175°05'E, *Salix* community near stream, 22.vii.1979, *I. Makarova* (LE 261503).

44. *Lichenochora elegantis* Hafellner

Notes. – Ascospores (19–)20–24.5(–28) × (4–)5 µm, l/b = (3.8–)4.0–5.0(–5.6) (n = 36), (4–)8-per ascus, while in the protologue they were reported as 28–33 × 4.5–6 µm, l/b = 5–6 and mostly 4 per ascus (Hafellner et al. 2008). The considerable variation in ascospore size could be due to the variable number of spores produced in each ascus. Causes slight bleaching. This recently described species was formerly known only from Austrian Alps and is new to Russia, Asia and Arctic.

Specimen Examined. – **RUSSIA. NENETZ REGION:** Vaigach Is., 70°16'N, 58°40'E, on *Xanthoria elegans* s. l. (th.), 23.viii.1998, *V. Shevchenko* (LE 261627).

45. *Lichenochora cf. polycoccoides* Hafellner & R. Sant.

Notes. – Ascospores hyaline, elliptic to broadly or occasionally narrowly elliptic, 1-septate, upper cell sometimes broader than the lower one, verruculose, non-halonate, (10–)11–14(–16) × 6–7(–9) l/b = (1.4–)1.6–2.2(–2.7) (n = 65, in phloxin). The size and shape of the ascospores are intermediate between those of *Lichenochora polycoccoides* and *L. obscuroides* (Linds.) Triebel & Rambold (Hafellner 1989). Induces gall-formation and change of color of infected host tissues. The species was formerly known only from Finland and adjacent Karelia region of Russia (Puolasmaa et al. 2008, Zhurbenko & Himelbrant 2002).

Specimens Examined. All specimens on *Physcia alnophila* (th., ap.) in *Salix* shrubs among tundra. – **RUSSIA. CHUKOTKA:** Enmyvaam River, 68°15'N, 166°03'E, 15.vii.1980, *I. Makarova* (LE 233499); Bezymyannoe Lake, 66°39'N, 176°40'E, 6.vii.1979, *I. Makarova* (LE 233509); Lunnaya River at 115 km of the road Egvekinot-Iul'tin, 67°05'N, 178°47'W, 26.vii.1970, *I. Makarova* (LE 233569).

46. *Lichenochora weillii* (Werner) Hafellner & R. Sant.

NOTES. – Sometimes induces swellings. New to Murmansk Region, Asian Russia, and Asia.

SPECIMENS EXAMINED. All specimens on thalli of *Physconia muscigena*. – **RUSSIA. MURMANSK REGION:** Kandalakshskii Gulf of White Sea, Cape Turii, 66°32'N, 34°30'E, coastal rocks, 29.vii.1967, *A. Dombrovskaya* (LE 233201:a). **SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 10 m, arctic desert, 21.vii.1996, *MZ 96946:a* (LE 233489:a). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, rocks in tundra, 22.viii.1995, *MZ 95419* (LE 233439).

47. *Lichenoconium erodens* M.S. Christ. & D. Hawksw.

NOTES. – Causes strong bleaching. New to Taimyr Pen. and Yakutiya.

SPECIMENS EXAMINED. Both specimens on *Evernia perfragilis* lobes, mostly on their decaying bases. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, carbonate outcrops in tundra, 9.viii.1995, *MZ 95512:b* (LE 260064:b). **YAKUTIYA:** lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, 4.viii.1998, *MZ 98393* (LE 261730).

48. *Lichenoconium lecanorae* (Jaap) D. Hawksw.

NOTES. – Infected host tissues bleached, dark or partly destroyed. New to Novaya Zemlya, Nenetz Region, and Wrangel' Is. *Ramalina* is a new host genus. *Evernia perfragilis, Lecanora baicalensis*, and *L. crustacea* are new host species.

SPECIMENS EXAMINED. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Olenka River mouth, 69°02'N, 36°25'E, alt. 50 m, coastal rocks with dwarf shrub tundra, on *Ramalina pollinaria* (lobes), 5.ix.1997, *MZ 97380* (LE 261690). **NOVAYA ZEMLYA:** Litke Bay, 72°24'N, 55°18 E, alt. 5 m, old wooden house, on *Lecanora* sp. (ap.: hymenium), growing on old lignum, 8.ix.1996, *N. Vekhov* (LE 261605). **NENETZ REGION:** Bol'shezemel'skaya Tundra, Cape Bolvanskii Nos, 68°18'N, 54°30'E, shrub tundra, on *Lecanora* sp. (ap.: hymenium), growing on *Betula nana* twig, 25.vii.1999, *O. Lavrinenko* (LE 261715); on *Lecanora symmicta* (ap.: hymenium), growing on *Betula nana* twig, 25.vii.1999, *O. Lavrinenko* (LE 261695); Vaigach Is., Dolgaya Bay, 70°16'N, 58°40'E, alt. 5 m, old wooden boat, on *Lecanora* sp. (ap.: hymenium), growing on lignum, 30.ix.1997, *N. Vekhov* (LE 261655). **POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°39'E, alt. 150 m, rocks in sparse *Larix* forest, on *Lecanora crustacea* (ap.: hymenium), 27.vi.1993, *MZ 93120* (LE 261614). **TAIMYR PEN.:** Dikson Is., 73°30'N, 80°20'E, alt. 30 m, boulder field in tundra, on *Allantoparmelia alpicola* (ap.: hymenium), 7.vii.1990, *MZ 90857* (LE 260213); Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200 m, rocks in tundra, on *Lecanora polytropa* (ap.: hymenium), 26.vii.1995, *MZ 95562:b* (LE 261574:b). **YAKUTIYA:** Laptevykh Sea coast, 1 km S of Tiksi, 71°37'N, 128°54'E, alt. 70 m, dwarf shrub tundra, on *Ramalina almquistii* (lobes), 18.vii.1998, *MZ 98394* (LE 261510). **WRANGEL' IS.:** Somnitel'naya River, 70°58'N, 179°35'W, *Salix* tundra, on *Evernia perfragilis* (bleached lobe base), 14.viii.1986, *T. Polozova* (LE 261590:a). **CHUKOTKA:** Baran'e Lake, 66°54'N, 175°15'E, boulders in tundra, on *Rhizoplaca chrysoleuca* (ap.: hymenium, also margins), 6.viii.1980, *I. Makarova* (LE 261734); Amguema River at 174 km of the road Egvekinot-Iul'tin, 67°41'N, 178°35'W, on *Lecanora baicalensis* (ap.: hymenium), growing on rocks among steppe-like tundra, 15.viii.1979, *I. Makarova* (LE 261684); Anadyr' Bay, lower Kurupka River, 64°45'N, 174°05'W, *Dryas* tundra, on *Bryonora castanea* (ap.: hymenium), 3.viii.1987, *A. Katenin* (LE 261617).

49. *Lichenoconium* cf. *usneae* (Anzi) D. Hawksw.

NOTES. – The species is characterized by verruculose conidia, which were not distinctly observed in the studied specimen. Causes bleaching of host tissues. The species was neither known in Asian Russia, nor from this host species.

SPECIMEN EXAMINED. – **RUSSIA. CHUKOTKA:** Bezymyannoe Lake, 66°39'N, 176°40'E, shrub tundra, on *Physcia alnophila* (ap., th.), 6.vii.1979, *I. Makarova* (LE 233689).

50. *Lichenoconium xanthoriae* M.S. Christ.

NOTES. – Conidia medium to dark olive brown, smooth, 4–5(–6) × (3–)3.5–4.5(–5) µm, l/b = 1.0–1.4(–2.0) (n = 55). In the protologue conidia were reported to be slightly smaller: 3–5 × 2.5–4 µm (Christiansen 1956). Infected hymenium becomes darker. New to the Arctic.

Specimen Examined. – **RUSSIA. NENETZ REGION:** Bol'shezemel'skaya Tundra, Ortin River, 67°59'N, 54°03'E, forest-tundra with *Picea obovata*, on *Xanthoria polycarpa* (ap.: hymenium) on spruce twig, 27.vi.1999, *O. Lavrinenko* (LE 261587).

51. *Lichenopeltella peltigericola* (D. Hawksw.) R. Sant.

Notes. – Growing on host lobes: mostly on lower side, including rhizines, occasionally on damaged portions of upper side. Sometimes on old lobes, but pathogenicity not observed. New to Taimyr Pen., Chukotka, and Kamchatka.

Specimens Examined. All specimens on *Peltigera* spp. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Dal'nie Zelentsy, 69°07'N, 36°05'E, alt. 20 m, dwarf shrub-moss-lichen tundra, on *P. polydactylon*-group, 22.viii.1997, *MZ 97363* (LE 233798); Khibiny Mts., Vud'yavrchorr Mt., 67°39'N, 33°38'E, sparse *Picea-Betula* forest, on *P. scabrosa*, 13.viii.1962, *A. Dombrovskaya* (LE 233788). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200 m, rocks in tundra, on *P. rufescens*, 22.vii.1995, *MZ 95444* (LE 233838). **CHUKOTKA:** Sireniki, 64°24'N, 173°54'W, tundra, on *P. leucophlebia*, 10.vii.1986, *A. Katenin* (LE 233825). **KAMCHATKA:** Esso, 55°55'N, 158°42'E, alt. 500 m, *Larix* forest, on *P. scabrosa*, 26.vii.1983, *A. Dombrovskaya* (LE 233778).

52. *Lichenostigma elongatum* Nav.-Ros. & Hafellner

Notes. – Causes bleaching of host tissues. New to Asian Russia and the Arctic. *Lobothallia melanaspis* is a new host species.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** junction of Pravaya Uboinaya and Uboinaya Rivers, 73°25' N, 82°51' E, alt. 60 m, boulders by the river, on *Lobothallia melanaspis* (th., ap.), 6.viii.1990, *MZ 90557* (LE 260023).

53. *Lichenostigma maureri* Hafellner

Notes. – Pathogenicity not observed. New to Evenkiya.

Specimen Examined. – **RUSSIA. EVENKIYA:** Nizhnyaya Chunku River, Surinda, 62°27'N, 96°41'E, taiga forest, on *Evernia mesomorpha* (th.), 29.ix.2008, *O. Sergeeva & V. Goncharov* (LE 260184).

54. *Llimoniella groenlandiae* (Alstrup & D. Hawksw.) Triebel & Hafellner
(Syn. *Unguiculariopsis groenlandiae* (Alstrup & D. Hawksw.) Etayo & Diederich)

Notes. – According to Diederich et al. (2010) the species is best placed in *Llimoniella*. Hymenium with oil droplets. Pathogenicity not observed. New to Svalbard.

Specimen Examined. – **NORWAY. SVALBARD:** Bünsow Land, Kapp Napier, foot of Teltfjellet Mt., 78°38'N, 16°44'E, alt. 30 m, spotty dwarf shrub tundra, on *Fulgensia bracteata* (th.), 19.vii.2003, *MZ 03228* (LE 260273).

55. *Merismatium coccisporum* (Norman) Vouaux

Note. – Pathogenicity not observed.

Specimens Examined. – **RUSSIA. CHUKOTKA:** Televeem River, 65°50'N, 175°05'E, stony dwarf shrub tundra, on *Euopsis pulvinata* (th.), 23.vii.1979, *I. Makarova* (LE 260073); Yanrakynnot, Marich River, 64°53'N, 172°30'W, carbonate outcrops, on *Rhizocarpon umbilicatum* (th.), 30.vii.1986, *A. Katenin* (LE 261594).

56. *Merismatium decolorans* (Arnold) Triebel

Notes. – Usually growing on old lobes, associated with slight local bleaching. New to Severnaya Zemlya, Taimyr Pen., and Chukotka. *Peltigera* is a new host genus.

Specimens Examined. All specimens on lobes and soralia of *Peltigera* spp. – **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 20 m, arctic desert, on *P. leucophlebia*, 17.vii.1996, *MZ 96956* (LE 233834). **TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 250 m, rocks in tundra, on *P. leucophlebia*, 17.viii.1995, *MZ 95493* (LE 233761). **CHUKOTKA:** Bezymyannoe Lake, 66°39'N, 176°40'E, *Salix* shrubs in tundra, on *P. extenuata*, 7.vii.1979, *I. Makarova* (LE 233938).

57. *Merismatium heterophractum* (Nyl.) Vouaux

NOTES. – Mostly associated with moribund hymenium or thallus. New to Nenetz Region. *Rinodina* is a new host genus, and *Lecanora epibryon* a new host species.

SPECIMENS EXAMINED. – **RUSSIA. NENETZ REGION:** Bol'shezemel'skaya Tundra, Cape Bolvanskii Nos, 68°18'N, 54°30'E, tundra, on *Rinodina turfacea* (ap.: hymenium, occasionally th.), 11.vii.1999, *O. Lavrinenko* (LE 261640). **SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, on *R. turfacea* (th.), 15.vii.1996, *MZ 961005* (LE 260132); same is., Cape Antseva, 78°12'N, 103°17'E, alt. 30 m, on *R. turfacea* (ap.: hymenium, occasionally th.), 12.viii.1997, *N. Matveeva* (LE 260181). **CHUKOTKA:** Iskaten' Range, 66°35'N, 179°10'W, moss-lichen tundra, on *Lecanora epibryon* (th.), 29.vi.1971, *I. Makarova* (LE 261736:a).

58. *Merismatium nigritellum* (Nyl.) Vouaux

NOTES. – Mostly associated with moribund thallus or hymenium. *Solorina* is a new host genus.

SPECIMENS EXAMINED. – **RUSSIA. SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, on *Megaspora verrucosa* (th.), 15.vii.1996, *MZ 961004* (LE 260103); same is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 10 m, arctic desert, on *Peltigera* sp. (both sides of decayed th. overgrown by various lichens), 21.vii.1996, *MZ 96957* (LE 233884); same is., middle Studenaya River, 78°37'N, 101°05'E, alt. 130 m, on *Psoroma hypnorum* (th.), 16.viii.1998, *N. Matveeva* (LE 260268). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 50 m, tundra, on *Solorina bispora* (th.), 25.viii.1995, *MZ 95477:c* (LE 233863:c). **CHUKOTKA:** Ioni Lake, 65°53'N, 173°44'W, stony tundra, on *Bryonora castanea* (th., ap.), 3.vii.1977, *I. Makarova* (LE 261757).

59. *Muellerella atricola* (Linds.) Sacc. & D. Sacc.

NOTES. – Perithecia almost immersed to ½ protruding. Ascospores pale to medium olive brown, ca. 100 per ascus, (4–)5–6.5(–7) × 2.5–3.5(–4) µm, l/b = (1.1–)1.6–2.2(–2.8) (n = 56). On host thallus, often thalline margins of apothecia, occasionally hymenium. Pathogenicity not observed. New to Russia, Asia and the Arctic.

SPECIMENS EXAMINED. All specimens on *Tephromela atra*. – **RUSSIA. YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Amerika-Khaya hill, 72°35'N, 126°18'E, alt. 50 m, rocks in tundra, 22.vii.1998, *Yu. Cherkasova* (LE 261575, LE 261584:b); lower Lena River, Taas-Ary Is., 71°50'N, 127°20'E, rock outcrops, 17.vii.1988, *I. Makarova* (LE 207617) [formerly erroneously reported as *Muellerella lichenicola* (Karatygin et al. 1999)]. **CHUKOTKA:** Inchoun, 66°15'N, 170°20'W, stony tundra, 29.vii.1975, *I. Makarova* (LE 261629:b).

60. *Muellerella erratica* (A. Massal.) Hafellner & V. John

NOTES. – Classification of 25 *Muellerella* specimens found on *Xanthoria* was difficult, as their characteristics somewhat deviated from the species concepts in Triebel (1989: 153). Ascospore sizes sometimes significantly varied within a single specimen. It is also noteworthy that a few 2-septate ascospores were observed (in LE 261788), which was not documented in Triebel (op. cit.). Results of the classification are presented in Table 2 (below). Infections were sometimes associated with bleached or damaged host portions. New to Franz Josef Land, Novaya Zemlya, Nenetz Region, and Severnaya Zemlya.

	M. lichenicola	*M. erratica*	*M. pygmaea*
number of specimens/spores examined	3/19	19/295	4/57
diam. of perithecia (µm)	75–125	(75–)100-150(-200)	100-250
number of ascospore septa	(0–)1	(0–)1(-2)	(0–)1
size of ascospores (µm)	(5.5–)6–7 × 3–3.5	(5–)6–8(–12) × (2.5–)3–4(–5)	(7–)7.5–9.5(–11) × 3.5–4.5(–5)
length/breadth ration of ascospores	(1.6–)1.7–2.1(–2.3)	(1.3–)1.6–2.4(–3.7)	(1.6–)1.7–2.3(–2.8)
color of ascospores	pale (medium) olive (brown)	pale to medium olive brown	(pale) medium (olive) brown

Table 2. Some comparative characteristics of *Muellerella* species growing on *Xanthoria*.

Specimens Examined. – **U.S.A. ALASKA:** Prudhoe Bay, Howe Is., 70°19'N, 148°00'W, lichen crusts between frostboils, on *Fulgensia bracteata* (th.), 28.viii.2001, *D. Walker* (LE 260253). **CANADA. NUNAVUT:** Ellesemere Is., Eureka, 80°06'N, 85°38'W, stony *Dryas* tundra, on *Xanthoria elegans* s. l. (th., ap.), 31.vii.1999, *N. Matveeva* (LE 261628). **RUSSIA. FRANZ JOSEF LAND:** Mac Clintock Is., Cape Dilon, 80°05'N, 55°54'E, arctic desert, on *X. elegans* s. l. (ap., th.), 30.vii.1930, *V. Savicz* (LE 261637). **NOVAYA ZEMLYA:** Ivanova Bay, 76°50'N, 68°45'E, on *X. elegans* (ap., th.), 31.viii.1995, *N. Vekhov* (LE 261597). **NENETZ REGION:** Bol'shoi Tsinkovyi Is. just NW of Vaigach Is., 70°27'N, 58°40'E, on *X. elegans* (th., ap.), 1997, *V. Shevchenko* (LE 261638). **POLAR URAL:** Eletz River, 67°02'N, 64°26'E, alt. 100 m, carbonate outcrops among shrub tundra, on *X. elegans* s. l. (th., ap.), 28.vi.1993, *MZ 93172* (LE 261647). **SEVERNAYA ZEMLYA**: Oktyabr'skoi Revolutsii Is.,Vatutina Cape, 79°26'N, 93°53'E, arctic desert, on *X. elegans* (ap., th.), 23.vii.1979, *E. Khodachek* (LE 261779). **TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30–40 m, rocks in dwarf shrub tundra, on *X. elegans* (ap., th.), 2.vii.1990, *MZ 90564* (LE 261657); 14.vii.1990, *MZ 90576:b* (LE 261549:b); junction of Pravaya Uboinaya and Uboinaya Rivers, 73°25' N, 82°51' E, alt. 60 m, boulders by the river, on *X. elegans* (ap., th.), 6.viii.1990, *MZ 90565* (LE 261749); Byrranga Mts., Krasnaya River, 74°35'N, 98°28'E, alt. 160 m, rocks in tundra, on *X. elegans* (ap., also th.), 12.viii. 1995, *MZ 95544* (LE 261717); on *Lecanora polytropa* (th.; ap.), 12.viii.1995, *MZ 95565:a* (LE 261624:a); same mts., Zamknutaya River, 74°36'N, 98°35'E, alt. 250 m, rocks in tundra, on *L. polytropa* (th.; ap.), 24.viii.1995, *MZ 95566* (LE 261744); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200–300 m, rocks in tundra, on *L. polytropa* (th.; ap.: hymenium), 25.vii.1995, *MZ 95561* (LE 261745); 26.vii.1995, *MZ 95560* (LE 261774); *MZ 95562:a* (LE 261574:a); on *L. dispersa* (th.; ap.: hymenium), 22.viii.1995, *MZ 95567* (LE 261524); on *Lecidea umbonata* (th.; ap.: hymenium), 30.viii.1995, *MZ 95564* (LE 261664) [pathogenicity not observed even in sections]; on *X. elegans* (ap., th.), 20.viii.1995, *MZ 95527:a* (LE 261578:a); E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, carbonate outcrops in tundra, on *X. elegans* (ap., also th.), 9.viii.1995, *MZ 95540* (LE 261727); on *Lecidea umbonata* (th.), 9.viii.1995, *MZ 95563* (LE 261564); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 50 m, pebbles in tundra, on *X. elegans* (th., ap.), 31.vii.1995, *MZ 95532:b* (LE 261598:b); *MZ* 95533 (LE 261788). **PUTORANA PLATEAU:** Kapchuk Lake, 69°28'N, 91°02'E, alt. 200 m, boulder field in sparse *Larix* forest, on *X. elegans* (ap., th.), 18.vii.1983, *MZ 83232* (LE 261527). **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Amerika-Khaya hill, 72°35'N, 126°18'E, alt. 50 m, rocks in tundra, on *X. elegans* (ap., th.), 30.vii.1998, *MZ 98396* (LE 261738); same delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, rocks among tundra, on *Lecidea umbonata* (th.), 12.viii.1998, *MZ 98399* (LE 261754); lower Lena River, Tit-Ary Is., 71°58'N, 126°18'E, alt. 20 m, rocks among forest-tundra, on *L. polytropa* (th., ap.), 17.vii.1988, *I. Makarova* (LE 261504:a); same river, N of Kharaulakh Range, Bulunkan-Khayata Mt., 72°17'N, 127°45'E, on *Aspicilia* sp. (th.), 23.vii.1988, *I. Makarova* (LE 261529:b); Laptevykh Sea coast, Suonannakh River near Tiksi, 71°37'N, 128°51'E, alt. 70 m, scree lichen tundra, on *X. elegans* s. l. (ap., th.), 13.viii.1982, *V. Perfil'eva* (LE 261507); New Siberian Is., Kotel'nyi Is., Bunge Land, Evseku-Bulgunnyakh Upland, ca. 75°30'N, 139°00'E, alt. 45 m, scree arctic desert, on *X. elegans* s. l. (th.), 12.viii.1980, *V. Perfil'eva* (LE 261678). **CHUKOTKA:** Televeem River, 65°50'N, 175°05'E, nival stony tundra, on *L. polytropa* (th.), 23.vii.1979, *I. Makarova* (LE 261654:a); Ioni Lake, 65°53'N, 173°44'W, stony tundra, on *X. elegans* (th., ap.), 3.vii.1977, *I. Makarova* (LE 261528); Lavrentiya Bay, 65°35'N, 171°00'W, stony tundra, on *Aspicilia* sp. (th.; ap.: hymenium, margins), 1.viii.1973, *I. Makarova* (LE 261755); on *L. dispersa* (th.; ap.: hymenium, margins), 1.viii.1973, *I. Makarova* (LE 261714); on *X.* cf. *elegans* (th.), 10.vii.1973, *I. Makarova* (LE 261687); Sireniki, 64°24'N, 173°54'W, stony tundra, on *X. elegans* (ap.), 20.vii.1983, *I. Makarova* (LE 261798:b).

61. *Muellerella lichenicola* (Sommerf.) D. Hawksw.

Notes. – Infected host parts often bleached or destroyed. New to Nenetz Region. *Phaeorrhiza* is a new host genus, and *Rinodina roscida* a new host species.

Specimens Examined. – **CANADA. NUNAVUT:** Victoria Is., Hardly Bay, 72°23'N, 109°19'W, polygonal *Dryas* tundra, on *Rinodina roscida* (ap.: hymenium, rarely th.), 8.viii.1999, *N. Matveeva* (LE 260241). **NORTHWEST TERRITORIES:** Banks Is., Green Cabin, 73°13'N, 119°33'W, alt. 75 m, cryptogamic crust on frost boils, on *Fulgensia bracteata* (th., ap.), 8.vii. 2003, *D. Walker* (LE 260283); on *Phaeorrhiza nimbosa* (ap.: hymenium), 8.vii.2003, *D. Walker* (LE 260083). **RUSSIA. NENETZ REGION:** Bol'shoi Tsinkovyi Is. just NW of Vaigach Is., 70°27'N, 58°40'E, on *Xanthoria elegans* (th., ap.), 1997, *V. Shevchenko* (LE 261658:a). **TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°28'E, alt. 160 m, rocks in tundra, on *X. elegans* s. l. (ap., th.), 12.viii.1995, *MZ 95545:a* (LE 261558:a); same mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 200 m, rocks in tundra, on *X. elegans* s. l. (ap.), 15.viii.1995, *MZ 95541:b* (LE 261777:b).

62. *Muellerella pygmaea* (Körb.) D. Hawksw.

Notes. – Perithecia 150–300 µm diam.; ascospores medium to dark brown, (6–)7.5–10(–11) × (3–)4–5.5(–6) µm, l/b = (1.0–)1.6–2.2(–3.3) (n = 92, excluding xanthoriicolous specimens). Infected host parts sometimes slightly bleached. The species is new to Polar and Northern Ural. *Rhizocarpon alpicola* and *R. eupetraeoides* are possibly new host species.

Specimens Examined. – **RUSSIA. POLAR URAL:** Sob' River, 66°59'N, 65°45'E, alt. 300 m, boulders in subalpine belt, on *Rhizocarpon* cf. *alpicola* (th., prothallus), 17.vii.1986, *MZ 86185* (LE 261739); on *Lecanora* sp. (ap.: discs, margins), 11.vii.1986, *MZ 86125* (LE 261724); alt. 200 m, boulders in *Larix sibirica* forest, on *R. alpicola* (th.), 13.vii.1986, *MZ 86116* (LE 261569:a). **NORTHERN URAL:** headwaters of the Pechora River, Yanypupuner Range, 62°05'N, 59°06'E, alt. 600 m, boulders in subalpine belt, on *Rhizocarpon* sp. (th.), 30.vi.1997, *MZ 97381* (LE 261630). **SEVERNAYA ZEMLYA:** Oktyabr'skoi Revolutsii Is., Skazochnaya Bay coast, 79°45'N, 97°00'E, alt. 50 m, stony arctic desert, on *Xanthoria elegans* (th.), 5.viii.1985, *M. Gavrilo* (LE 261699). **TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 40 m, boulders in dwarf shrub tundra, on *X. elegans* (ap., th.), 2.vii.1990, *MZ 90880* (LE 261797); Byrranga Mts., Zamknutaya River, 74°36'N, 98°35'E, alt. 250 m, rocks in tundra, on *X. elegans* (ap., th.), 24.viii.1995, *MZ 95543* (LE 261747); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, rocks in tundra, on *X. elegans* (ap., th.), 24.vii.1995, *MZ 95528* (LE 261508). **CHUKOTKA:** Lunnaya River at 115 km of the road Egvekinot-Iul'tin, 67°05'N, 178°47'W, stony tundra, on *R. geographicum* (th.), 7.viii.1970, *I. Makarova* (LE 261570); Puoten Bay, 65°50'N, 170°30'W, stony tundra, on *Rhizocarpon* sp. (th.), 18.vii.1972, *I. Makarova* (LE 261579).

63. *Muellerella ventosicola* (Mudd) D. Hawksw.

Notes. – Perithecia 150–250 µm diam. Ascospores medium to dark brown, (0–)1-septate, (6–)7–8.5(–10) × (4–)4.5–5.5(–8) µm, l/b = (1.0–)1.3–1.8(–2.3) (n = 136). Pathogenicity not observed. New to Wrangel' Is. *Rhizocarpon eupetraeoides* is possibly a new host species.

Specimens Examined. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, 3 km S of Dal'nie Zelentsy, 69°04'N, 36°05'E, alt. 80 m, rocks in tundra, on *Rhizocarpon alpicola* (th.), 26.viii.1997, *MZ 97382* (LE 261619). **YAKUTIYA:** lower Lena River, N of Kharaulakh Range, Bulunkan-Khayata Mt., 72°17'N, 127°45'E, alt. 140 m, scree tundra, on *R. geographicum* (th.), 23.vii.1988, *I. Makarova* (LE 261580); Laptevykh Sea coast, 5 km S of Tiksi, 71°36'N, 128°58'E, alt. 20 m, shale outcrops in tundra, on *R. geographicum* (th.), 19.vii.1998, *MZ 98395* (LE 261559). **WRANGEL' IS.:** Gusinaya River, 71º08'N, 179º10'E, on *R. geographicum* (th.), 1991, *V. Shtrik* (LE 261560). **CHUKOTKA:** Amguema River at 174 km of the road Egvekinot-Iul'tin, 67°41'N, 178°35'W, boulders in tundra, on *R. geographicum* (th.), 9.viii.1979, *I. Makarova* (LE 261599); Inchoun, 66°15'N, 170°20'W, stony tundra, on *R. eupetraeum* (th.), 29.vii.1975, *I. Makarova* (LE 261659); Ioni Lake, 65°53'N, 173°44'W, stony tundra, on *R. geographicum* (th.), 5.vii.1977, *I. Makarova* (LE 261639); Puoten Bay, 65°50'N, 170°30'W, pebbles in tundra, on *R. eupetraeoides* (th.), 19.vii.1972, *I. Makarova* (LE 261689); Lavrentiya Bay, 65°35'N, 171°00'W, stony tundra, on *R. geographicum* (th., prothallus), 16.vii.1972, *I. Makarova* (LE 261530); 28.vii.1973, *I. Makarova* (LE 261649).

64. *Nanostictis peltigerae* M.S. Christ.

Notes. – Mostly on decaying host tissues, pathogenicity not observed. New to Severnaya Zemlya and Yakutiya.

Specimens Examined. All specimens on *Peltigera leucophlebia* (lobes: underside, occasionally upper side; rhizines). – **RUSSIA. MURMANSK REGION:** Akhkio-Oya River S of Alakurtti, 66°56'N, 30°20'E, alt. 160 m, *Pinus* forest, 30.vii.1971, *A. Dombrovskaya* (LE 233658). **SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 20 m, arctic desert, 17.vii.1996, *MZ 96956* (LE 233834); **TAIMYR PEN.:** Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, 4.ix.1995, *MZ* 95440 (LE 233918). **YAKUTIYA:** Lena River delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, 1.viii.1998, *MZ 98324* (LE 233888).

65. *Nectriopsis lecanodes* (Ces.) Diederich & Schroers

Note. – Sometimes causes local bleaching of host tissues. New to Leningrad Region and Yakutiya.

Specimens Examined. – **RUSSIA. LENINGRAD REGION:** Novaya Ladoga, 60°00'N, 32°10'E, in sparse *Betula* forest, on *Peltigera malacea* (lobes: upper, occasionally lower sides), 26.v.2005, *E. Popov* (LE 233924). **YAKUTIYA:** junction of Indigirka and In'yali Rivers, 65°10'N, 143°10'E, alt. 450 m, *Larix* forest, on *P. rufescens* (old lobes: upper side), 16.vi.1976, *I. Makarova* (LE 233628).

66. *Neolamya peltigerae* (Mont.) Theiss. & Syd.

Notes. – Heavy infections occasionally cause slight bleaching of host tissues. New to Yakutiya and Chukotka, also to the Russian Arctic.

Specimens Examined. All specimens on upper lobe surface of *Peltigera didactyla*. – **RUSSIA. TYVA:** Biy-Khem River, Toora-Khem, 52º26'N, 96º05'E, alt. 850 m, mixed forest, 22.vii.1996, *T. Otnyukova* (LE 233978). **YAKUTIYA:** junction of Indigirka and In'yali Rivers, 65°10'N, 143°10'E, alt. 450 m, *Larix* forest, 23.vi.1976, *I. Makarova* (LE 233988). **CHUKOTKA:** middle Palyavaam River, 68°45′N, 173°49′E, tundra, 1980, *B. Yurtsev* (LE 233558); Enmyvaam River, 68°15'N, 166°03'E, tundra, 2.vii.1980, *I. Makarova* (LE 233968).

67. *Nesolechia oxyspora* (Tul.) A. Massal. var. *oxyspora*

Note. – Pathogenicity not observed.

Specimens Examined. – **U.S.A. ALASKA:** ca. 50 km ENE of Fairbanks, Caribou-Poker Creeks Watershed, 65°10'N, 147°29'W, alt. 520 m, on *Alnus crispa* in mixed forest, on *Parmelia sulcata* (th.), 13.ix.2000, *MZ 00415* (LE 210266); Wrangell Saint Elias Park and Preserve, Yakutat, Lucia Creek, 59°53'N, 139°52'W, alt. 110 m, upland with closed tall shrub, on *P. sulcata* (th.), 2.vii.2004, *G. Frost* (LE 260201:b).

68. *Niesslia peltigericola* (D. Hawksw.) Etayo

(syn. *Raciborskiomyces peltigericola* (D. Hawksw.) M.E. Barr)

Notes. – Ascomata subglobose, occasionally collapsed when old, usually sessile, 50–150 µm diam., with setae 25–50 × 3–6 µm. Asci obclavate, lanceolate or narrowly elliptic, not always thickened at the apex, with a distinct apical beak, (43–)49–75(–90) × (9–)10–16(–18) µm (n = 34), wall I and K/I+ pale blue [plasma I and K/I+ yellow], 8-spored. Ascospores hyaline to pale grey-olive when old, narrowly elliptic, usually with acute apices, (0–)1-septate, not to markedly constricted at the septum, cells equal or occasionally the upper one slightly wider, guttulate, smooth-walled, non-halonate, (11–)13.5–17.5(–20) × (3.5–)4.5–6(–8) µm, l/b = (2.0–)2.5–3.5(–4.3) (n = 142), the size often strongly varying even within the same ascus, biseriate in an ascus. In the species protologue its asci were reported as c. 65 × 10 µm and ascospores 12–16 × 3.5–4.5 µm (Hawksworth 1980: 385). Evidently saprotrophic. New to Severnaya Zemlya, Irkutsk Region, and Yakutiya.

Specimens Examined. All specimens on decaying lobe portions (upper sides, occasionally on lower raised sides by the margins) or cephalodia of *Peltigera* spp. – **RUSSIA. MURMANSK REGION:** Khibiny Mts., Vud'yavrchorr Mt., 67°39'N, 33°38'E, alt. 500 m, *Betula* krummholz, on *P. aphthosa*, 4.viii.1969, *A. Dombrovskaya* (LE 233995:a); on *P. leucophlebia*, 4.viii. 1969, A. Sulyalina (LE 233745:a); Kanevka, 67°08'N, 39°38'E, *Betula* forest, on *P. leucophlebia*, 15.vii.1990, *T. Dudoreva* (LE 233945); Pyukhyakuru River, 66°47'N, 30°00'E, alt. 230 m, boulders in forest, on *P. aphthosa*, 1.vii.1972, *A. Dombrovskaya* (LE 233751:a); Kandalakshskii Gulf of White Sea, Velikii Is., Marfin navolok, 66°34'N, 33°18'E, *Picea* forest, on *P. aphthosa*, 24.vi.1951, *N. Parfent'eva* (LE 233917:a). **SEVERNAYA ZEMLYA** (arctic desert): Oktyabr'skoi Revolutsii Is., Parizhskoi Kommuny Peninsula, Cape Vazhnyi, 79°27'N, 93°40'E, alt. 20 m, on *P. leucophlebia*, 29.vii.1985, *M. Gavrilo* (LE 233791); Bol'shevik Is., between Shokal'skogo Strait and Mikoyana Bay, 79°17'N, 101°50'E, alt. 40 m, on *P. leucophlebia*, 20.vii.1996, *MZ 96951* (LE 233784); on *P. rufescens*, 20.vii.1996, *MZ 96950* (LE 233984); W coast of Akhmatova Bay, 79°04'N, 102°41'E, alt. 40 m, on *P. leucophlebia*, 18.vii.1996, *MZ 96948:b* (LE 233864:b). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200 m, stony tundra, on *P. aphthosa*, 22.vii.1995, *MZ 95457* (LE 233805); Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, on *P. leucophlebia*, 4.ix.1995, *MZ 95439:b* (LE 233928:b). **IRKUTSK REGION:** Nizhne-Ilimskii District, top of Rudnaya Mt., ca. 56°30'N, 104°00'E, *Pinus* forest, on *P. leucophlebia*, 22.vii.1961, *Karpenko* (LE 233946:b). **YAKUTIYA:** Laptevykh Sea coast, 1 km S of Tiksi, 71°37'N, 128°54'E, alt. 70 m, dwarf shrub tundra, on *P. leucophlebia*, 18.vii.1998, *MZ 98342* (LE 233765).

69. *Odontotrema cuculare* (Norman) Diederich

Notes. – New to Russia and Asia. Previously known only on *Parmeliopsis hyperopta*; *P. ambigua* is a new host species (Diederich et al. 2002).

Specimen Examined. – **RUSSIA. SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°26'E, alt. 1400 m, sparse *Pinus sibirica-Abies sibirica* forest, on *Parmeliopsis ambigua* (th.) above lignum, 19.vii.2009, *MZ 0917* (LE 260243).

70. *Odontotrema japewiae* Zhurb. & Diederich sp. nov.

MYCOBANK #515563.

PLATE 2 (PAGE 143).

Odontotrema lichenicola in thallo *Japewiae* vigens, insignis ascomatibus 250–400 µm, poro 30–150 µm, margine 70–170 µm, hymenio 90–100 µm, ascis 63–77 × 9–13 µm, ascosporis amyloideis 3-septatis, 14–16.5 × 5–6 µm.

TYPE: **RUSSIA. MURMANSK REGION:** Barents Sea coast, Porchnikha Bay at 10 km ENE of Dal'nie Zelentsy settlement, 69°04'N, 36°15'E, alt. 50 m, on *Japewia tornoënsis* (apothecia and thallus), growing on old wooden telegraph pole among shrub tundra, 7.ix.1997, *MZ 97355* (LE 261623, holotype).

DESCRIPTION. – *Ascomata* dispersed to contiguous, cleistohymenial, subglobose and often applanate to slightly concave, even when young and closed, sometimes constricted at the base, (150–)250–400(–500) µm diam., dark snuff brown to umber, matt, first immersed in host tissues, eventually superficial, initially closed, then opening by a pore 30–150(–350) µm diam., exposing a pale buff, more or less concave disc; margins incurved towards the pore, often radially striate, 70–170 µm wide. *Exciple* paraplectenchymatous, of thick-walled cells 4–7(–10) µm across, brown, darker in outer exposed layers; without hairs; parts enclosing the hymenium 60–100 µm, lateral parts at hymenium level and basal parts 40–50 µm thick; not changing color in K or HNO_3. *Periphysoids* sometimes distinct on the inner excipular layer near hymenium, branched, septate, 15–20 × 1.5–2 µm. *Hypothecium* absent. *Subhymenium* hyaline, ca. 15 µm thick. *Hymenium* hyaline, 90–100 µm tall, I+ orangish yellow, but I+ blue above, K/I+ blue (coloration is evidently caused by reaction of the asci). *Epihymenium* hyaline. *Paraphyses* filiform, not branched, scarcely septate, 1.5–2 µm diam., apically not or rarely slightly thickened up to 2.5 µm. *Asci* subcylindrical, (52–)63–77(–85) × (8–)9–13(–16) µm (n = 32, in KOH), with rounded apex and broad rounded foot, tholus up to 3 µm thick, sometimes with a distinct ocular chamber, 8-spored; ascoplasma I+ orangish yellow, K/I+ brownish orange/vinaceous to clay pink; wall apically I+ blue, below I-, K/I+ pale blue throughout or K/I-. *Ascospores* hyaline, elliptic to narrowly elliptic, with rounded ends, (0–)3-septate, not or rarely slightly constricted at the septa, wall and septa ca. 0.7 µm thick, septal torus and lamella not observed, (12.5–)14–16.5(–17.5) × (4.5–)5–6(–6.5) µm, l/b = (2.0–)2.5–3.1(–3.5) (n = 129, in water or KOH), smooth-walled, perispore not observed, overlapping uniseriate in an ascus; wall and septa I+ brownish red, K/I+ blue. *Conidiomata* not found.

ETYMOLOGY. – Dwelling on *Japewia*.

MATRIX AND BIOLOGY. – Grows on apothecia and thalli, occasionally also on lignum evidently with prothallus of *Japewia tornoënsis* (Ramalinaceae), growing on naked lignum. Partly associated with somewhat damaged/bleached portions of host thallus.

DISTRIBUTION. – Known from the type locality in coastal tundra on the northern edge of Kola Peninsula, close to the northern limit of boreal forests.

OBSERVATIONS. – Following Diederich et al. (2002) *Odontotrema japewiae* is most similar to *O. cuculare* growing on *Parmeliopsis* spp. (Parmeliaceae), *O. ochrolechiae* Diederich, Holien & Zhurb. growing on *Ochrolechia* spp. (Ochrolechiaceae) and *Odontotrema* sp. 3 growing on lignicolous and corticolous *Lecanora* spp. (Lecanoraceae). *Odontotrema cuculare* mainly differs by larger ascomata, (450–)470–590(–640) µm, a larger ascomatal margin, 200–260(–300) µm, longer and narrower asci, 80–90 × 5–7 µm, slightly narrower ascospores, 4.5–5(–5.5) µm broad, and ascospore wall and septa not reacting with K/I. *Odontotrema ochrolechiae* differs by slightly smaller ascomata, (180–)230–330(–400) µm, a smaller ascomatal pore, (0–)5–50(–150) µm, shorter and more sparse periphysoids, 7–9 × 3–4 µm, a lower hymenium, 55–70 µm tall, and smaller ascospores, (11–)12–14.5(–16) × (4.5–)5–5.5(–6) µm. *Odontotrema* sp. 3 differs by smaller ascomata, (180–)210–290(–350) µm, a smaller ascomatal pore, (0–)20–80(–140) µm, more reduced periphysoids, a lower hymenium, 45–80 µm tall, slightly shorter asci, 40–70 × 7–14 µm long, and slightly shorter ascospores, (12–)13–15.5(–17) µm long. Additionally the hosts of all these species belong to different families of the Lecanorales.

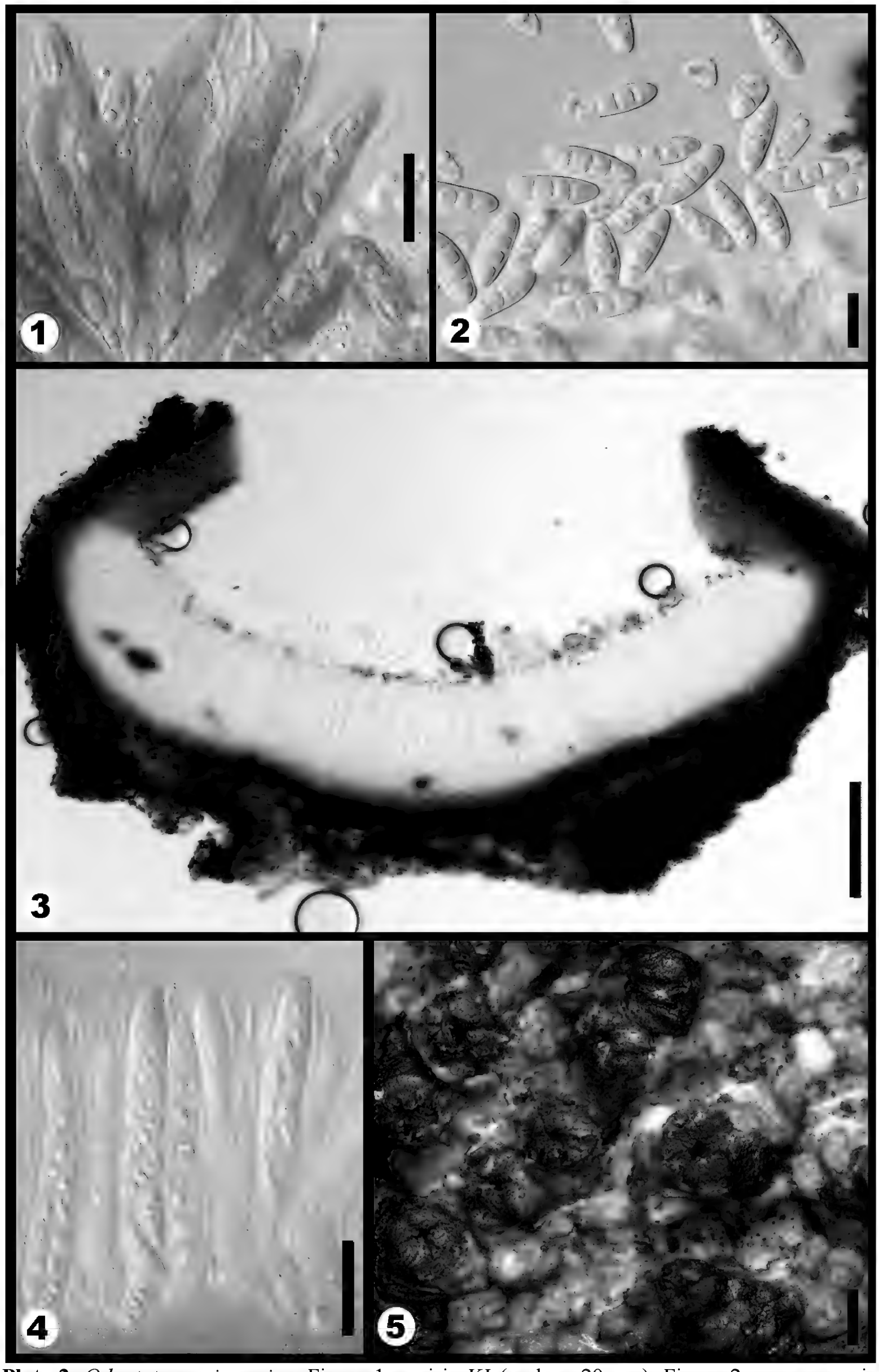


Plate 2. *Odontotrema japewiae*. Figure 1, asci in KI (scale = 20 µm). Figure 2, ascospores in water (scale = 10 µm). Figure 3, ascoma in cross section (scale = 100 µm). Figure 4, asci in K (scale = 20 µm). Figure 5, habitus (scale = 0.2 mm).

71. *Opegrapha geographicola* (Arnold) Hafellner

NOTES. – Pathogenicity not observed. New to Russia, Asia and the Arctic.

SPECIMEN EXAMINED. – **RUSSIA. CHUKOTKA:** Lavrentiya Bay, 65°35'N, 171°00'W, stony tundra, on *Rhizocarpon geographicum* (th.), 25.vii.1973, *I. Makarova* (LE 261759).

72. *Opegrapha pulvinata* Rehm var. *placidiicola* Zhurb. var. nov.

MYCOBANK #515564.

PLATE 3 (PAGE 145).

Similis *Opegraphae pulvinatae* var. *pulvinatae*, sed ab ea imprimis differt ascosporis brevioribus 15–19 × 5.5–7 µm et hymenio I+ rubro.

TYPE: **RUSSIA. Chukotka:** Loren River, 65°40'N, 171°50'W, dwarf shrub-lichen tundra over carbonates, on squamules of *Placidium* cf. *squamulosum*, 15.viii.1972, *I. Makarova* (LE 261593, holotype).

DESCRIPTION. – *Ascomata* black, slightly glossy, epruinose, sessile, angular elongated/rounded, up to 350 µm across, margins elevated, 50–80 µm wide, often curved to flexuose, densely clustered and contiguous, forming patches to 1.5 mm across. *Disc* slit-like or exposed and to 150 µm across, concolorous with margins. *Exciple* dark brown to almost black, indistinctly pseudoparenchymatic, closed and contiguous with hypothecium, 30–100 µm thick laterally, 20–50 µm basally, K–. *Epihymenium* pale brown. *Hymenium* hyaline, 60–90 µm tall, I+ orange-red, but occasionally with I+ blue spots above, K/I+ blue. *Subhymenium* colorless to pale brown. *Paraphysoids* septate, branched, pale to medium brown and granulose above, 1.5–3 µm diam., apices sometimes slightly swollen to 3.5 µm diam. *Asci* bitunicate, clavate to cylindrical-clavate, wall continuously thickened towards the apex, ocular chamber 1.5–2.5 × 1–1.5 µm, sometimes indistinct, apical nasse not observed, (40–)41–53(–55) × (13–)14–16(–17) µm (n = 13), (2–)6 spored, wall K/I+ blue, tholus with K/I+ blue apical ring; of *Varia*-type (Ertz & Egea 2007: 256). *Ascospores* straight, (narrowly) elliptic/obovate, oblanceolate or clavate, at first hyaline then medium brown, granulose when mature, distinct gelatinous sheath not recognized, (1–)3-septate, constricted at the septa, (10.5–)15–19(–23.5) × (4.5–)5.5–7(–7.5) µm, l/b = (1.8–)2.3–3.1(–4.0) (n = 74), overlapping biseriate in an ascus, K+ becoming olive brown; similar to *Parasitica*-type sensu Ertz & Egea (2007: 256). *Conidiomata* immersed, pycnidial, dark brown, subglobose, 40–70 µm diam. *Conidia* hyaline, simple, mostly very narrowly oblong/elliptic, 2.5–4 × 1–1.5 µm.

ETYMOLOGY. – Dwelling on *Placidium*.

MATRIX AND BIOLOGY. – Grows on squamules of *Placidium* cf. *squamulosum* (Verrucariaceae), growing on soil. Pathogenicity not observed.

DISTRIBUTION. – Known only from the type locality in tundra zone of North-East Asia.

OBSERVATIONS. – *Opegrapha pulvinata* has so far been reported only from members of Verrucariaceae, mostly from *Dermatocarpon* spp., but not from *Placidium*. *Opegrapha pulvinata* var. *pulvinata* differs from the new taxon in having an I+ blue hymenium, larger asci, 60–65 × 18–20 µm, and somewhat longer ascospores, (18–)20–24(–26) × 6–7 (–8) µm (Ertz & Egea 2007).

NOTE. *Opegrapha pulvinata* was unknown from the Arctic and Asian Russia.

73. *Phacopsis* cf. *cephalodioides* (Nyl.) Triebel & Rambold

NOTES. – The specimen differs from the species description given by Triebel et al. (1995) in having more elongate and narrower ascospores (7–)8.5–11(–13) × 4–5(–6) µm, l/b = (1.2–)1.7–2.7(–3.3) (n = 18) vs. 9–11(–12) × (4–)5–7(–8) µm. Almost all previous reports of this fungus were from *Hypogymnia* host species. However, it has also been reported from *Melanelia commixta*, though this report was later considered as incorrect (Rambold & Triebel 1992: 114, Triebel et al. 1995). The species was not previously reported in the Arctic.

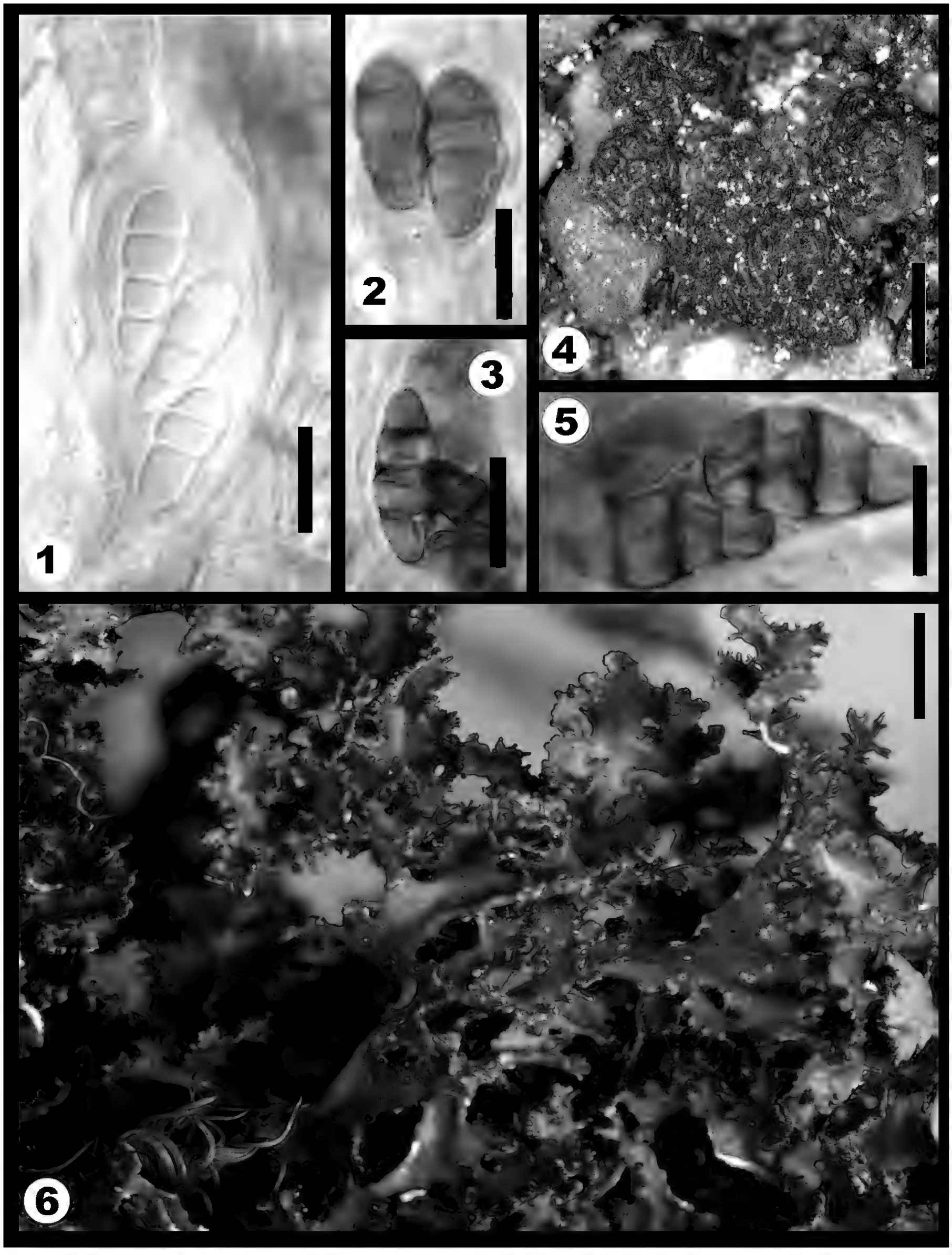


Plate 3. *Opegrapha pulvinata* var. *placidiicola* (figures 1-5) and *Cetraria rassadinae* (figure 6). Figure 1, ascus with immature ascospores in water (scale = 10 µm). Figures 2, 3, and 5, ascospores in water (scale = 10 µm except in 5 which is 5 µm). Figure 4, habitus (scale = 0.5 mm). Figure 6, habitus of *C. rassadinae* (scale = 1 mm).

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 20 m, boulders in dwarf shrub tundra, on *Melanelia commixta* (th.), 12.vii.1990, *MZ 90401* (LE 260102).

74. *Phaeoseptoria peltigerae* Punith. & Spooner

Notes. – Infected lobe portions bleached. New to Russia, Asia and the Arctic.

Specimen Examined. – **RUSSIA. YAKUTIYA:** Lena River delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, on *Peltigera rufescens* (upper side of old lobes), 1.viii.1998, *MZ 98366* (LE 260149).

75. *Phaeospora parasitica* (Lönnr.) Arnold

Notes. – Perithecia 150–200 µm diam. Ascospores hyaline then medium brown, (1–)3-septate, (14–)15.5–18(–19) × (7–)7.5–8.5(–9) µm, l/b = (1.7–)1.9–2.3(–2.4) (n = 26). New to Arctic Alaska.

Specimen Examined. – **U.S.A. ALASKA:** Cape Krusenstern National Monument, Noak Mt., 67°09'N, 163°01'W, alt. 291 m, *Dryas* tundra, on *Rhizocarpon umbilicatum* (th.), 11.vii.2003, *M. Emers* (LE 261620).

76. *Phaeospora peltigericola* D. Hawksw.

Notes. – Perithecia black, glossy, subglobose, sessile, 75–100 µm diam. Hymenial gel hemiamyloid. Ascospores hyaline to pale greyish or brownish olive, narrowly elliptic, occasionally somewhat wider above, (1–)3(–4)-septate, usually not or only slightly constricted at the septa, (8.5–)11.5–14(–17) × (3.5–)4–5(–6.5) µm, l/b = (2.2–)2.5–3.5(–4.4) (n = 120, in water, KOH or BCr), smooth-walled, non-halonate, 8 per ascus. Endoascus and spore wall BCr-. New to the Russian Arctic and Yakutiya.

Specimens Examined. All specimens on old/decaying lobes and cephalodia of *Peltigera leucophlebia*, unless otherwise indicated. – **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 10–20 m, arctic desert, 17.vii.1996, *MZ 96975* (LE 260140); 18.vii.1996, *MZ 96973* (LE 260150). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200–300 m, dwarf shrub stony tundra, 22.vii.1995, *MZ 95486* (LE 260220); *MZ 95490* (LE 260170); Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 250 m, rocks in tundra, 17.viii.1995, *MZ 95494* (LE 260120). **YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 50 m, tundra, on *Peltigera* sp., 12.viii.1998, *MZ 98367* (LE 260269).

77. *Phaeosporobolus alpinus* R. Sant., Alstrup & D. Hawksw.

Note. – The species was supposed to be restricted to *Ochrolechia* and *Pertusaria*. However, it has also been reported from *Baeomyces, Caloplaca, Cladonia, Flavocetraria, Flavoparmelia*, *Umbilicaria* and some other genera (Alstrup et al. 2000, Boqueras 2000, Etayo & Breuss 1996). *Anaptychia*, *Physia*, and *Physconia* are new host genera.

Specimens Examined. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°28'E, alt. 160 m, rocks in tundra, on *Anaptychia ethiopica* (old lobes: mostly on naked mudulla of the underside, occasionally on the uper side), 12.viii. 1995, *MZ 95411* (LE 233459) [host species identified by G. P. Urbanavichus]; same mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 250 m, rocks in tundra, on *Physconia muscigena* (old bleached lobes), 17.viii.1995, *MZ 95409:b* (LE 233549:b). **CHUKOTKA:** Iskaten' Range, 66°35'N, 179°10'W, stony tundra, on *Physcia phaea* (old lobes), 20.vii.1971, *I. Makarova* 224 (LE 233618).

78. *Phaeosporobolus usneae* D. Hawksw. & Hafellner

Notes. – Conidia multicelled, 8–20 µm across with individual cells 3–5 µm diam. Separation from *Phaeosporobolus alpinus* is mainly host-based. Pathogenicity not observed. New to Polar Ural, Yakutiya, Wrangel' Is., Chukotka, and Magadan Region. *Alectoria* is a new host genus.

Specimens Examined. On *Evernia perfragilis* (throughout lobes, often more abundant at their bases), unless otherwise indicated. – **CANADA. NUNAVUT:** Victoria Is., Cambridge Bay, Pelly Mt., 69°06'N, 105°07'W, 7.viii.1999, *N. Matveeva* (LE 260104:c). **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°39'E, alt. 150 m, rocks in sparse *Larix* forest, on *Evernia mesomorpha*, growing on soil, 27.vi.1993, *MZ 93122* (LE 260294). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga

Lake, 74°31'N, 98°36'E, alt. 200–300 m, rocks in tundra, 24.vii.1995, *MZ 95514* (LE 260214); 20.viii.1995, *MZ 95511* (LE 260254); 26.viii.1995, *MZ 95510* (LE 260274); E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, carbonate outcrops in tundra, 9.viii.1995, *MZ 95512:a* (LE 260064:a); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 150 m, carbonate outcrops in tundra, 1.viii.1995, *MZ 95513* (LE 260224). **YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, stony tundra, 12.viii.1987, *V. Perfil'eva* (LE 260164); lower Lena River, Kharaulakh Range, Yuryung-Kysam Urochishche opposite Tit-Ary Is., 71°59'N, 126°19'E, alt. 150 m, rocks in tundra, 19.viii.1998, *MZ 98386* (LE 260264); Laptevykh Sea coast, 4 km NW of Tiksi, 71°39'N, 128°44'E, alt. 100 m, stony tundra, 24.viii.1998, *MZ 98320* (LE 233371). **WRANGEL' IS.:** Gusinaya River, 71°08'N, 179°10'E, 1991, *V. Shtrik* (LE 260114); Somnitel'naya River, 70°58'N, 179°35'W, tundra, 14.viii. 1986, *T. Polozova* (LE 261590:b); 1985, *S. Kholod* (LE 260284). **CHUKOTKA:** Chukotskii Pen., Reunei Mt., stone field, 66°22'N, 171°13'W, 8.viii.1938, Trushkovskii (LE 261650); Inchoun, 66°15'N, 170°20'W, scree tundra, 29.vii.1975, *I. Makarova* (LE 261700); Loren River, 65°40'N, 171°50'W, scree tundra, 15.viii.1972, *I. Makarova* (LE 260174); Lavrentiya Bay, 65°35'N, 171°00'W, stony tundra, 10.vii.1973, *I. Makarova* (LE 260044); Yanrakynnot, 64°53'N, 172°30'W, dry stony tundra, 23.vii.1976, *A. Sytin* (LE 260194); 18.viii.1978, N. Sekretareva (LE 260204); Sireniki, 64°24'N, 173°54'W, rock outcrop in tundra, on *Ramalina pollinaria* (lobes, soralia), 8.vii.1986, *A. Katenin* (LE 261750). **MAGADAN REGION:** Snezhnaya Dolina near Magadan, 59°44'N, 150°50'E, alt. 200м, *Larix* forest, on *Alectoria ochroleuca* (branches, ap.: mainly thalline margins), 14.ix.2004, *N. Sazanova* (LE 260084).

79. *Phoma* cf. *caloplacae* D. Hawksw.

Notes. – Conidiomata ca. 100 µm diam. Conidia hyaline, smooth-walled, subglobose, 4–5(–6) × (3–)3.5–4(–4.5) µm, l/b = 1.0–1.4(–1.7) (n = 20). In the species protologue conidia were reported as subglobose, (4–)5–6(–7) µm diam. (Hawksworth 1981: 51). In LE 233063 and LE 233092 (both in the hymenium of *Caloplaca cerina*) examined for comparison they are (5–)5.5–7 × 3.5–4.5(–5) µm, l/b = 1.3–1.5–1.7(–2.0) (n = 14). The species was known in Russia only from the type locality at Yenisei River (60°20'N, taiga forest zone) southwards of Taimyr Pen. and Chukotka (Zhurbenko 2009a). The formerly reported hosts were *Caloplaca* (host of the type) and *Bryonora*. Causes darkening.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 250 m, rocks in tundra, on *Lecanora geophila* (ap.: hymenium), 28.vii.1995, *MZ 95546* (LE 261567).

80. *Phoma denigricans* Hafellner

Notes. – In LE 261785:a and LE 261765:a the *Phoma* was intimately associated with *Polycoccum bryonthae*. New to Russia, Asia and the Arctic.

Specimens Examined. All specimens in hymenia of *Lecanora epibryon*, which become black. – **CANADA. NUNAVUT:** Axel Heiberg Is., Bunde Fjord, 80°30'N, 94°35'W, *Dryas* tundra, 1.viii.1999, *N. Matveeva* (LE 261746:a). **NORWAY. SVALBARD:** Bünsow Land, Kapp Napier, foot of Teltfjellet Mt., 78°38'N, 16°44'E, alt. 30 m, spotty dwarf shrub-lichen-moss tundra, 19.vii.2003, *MZ 03225:a* (LE 261785:a). **RUSSIA. YAKUTIYA:** Lena River delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, dwarf shrub tundra, 28.vii.1998, *MZ 9871:a* (LE 261765:a).

81. *Phoma* cf. *epiphyscia* Vouaux

Notes. – Conidia in the specimen on *Physconia* are (6–)6.5–7.5(–8.5) × (2.5–)2.5–3(–3.5) µm, l/b = (1.8–)2.2–2.8(–3.1) (n = 41, in phloxin), those on *Xanthoria* are (4–)4.5–6(–7) × (2–)2.5–3(–4) µm, l/b = (1.4–)1.6–2.2(–3.0) (n = 33). According to Hawksworth & Cole (2004) conidia of *P. epiphyscia* are (4–)6–7 × (2–)3 µm, l/b = 2–2.3. Infected host tissues become darker or bleached. In the protologue two hosts were mentioned, viz. *Xanthoria parietina* and *Phaeophyscia orbicularis* (Vouaux 1914: 197). The species has mostly been reported from *Xanthoria*, but also from *Phaeophyscia* and *Physcia* (Alstrup & Hawksworth 1990, Søchting et al. 2007). It was unknown from Russia, Asia or the Russian Arctic, and from *Physconia*.

Specimens Examined. – **RUSSIA. TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30 m, rocks in dwarf shrub tundra, on *Xanthoria elegans* (ap.: hymenium), 14.vii.1990, *MZ 90576:a* (LE 261549:a); Byrranga Mts., E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, carbonate rocks in tundra, on *X. elegans* (ap.), 9.viii.1995, *MZ 95539* (LE 261787); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 150 m, carbonate rocks in tundra, on *X. elegans* (ap.: hymenium; th.), 1.viii.1995, *MZ 95537* (LE 261648). **CHUKOTKA:** Sireniki, 64°24'N, 173°54'W, tundra, on *Physconia muscigena* (th.), 8.vii.1986, *A. Katenin* (LE 233539).

82. *Phoma peltigerae* (P. Karst.) D. Hawksw.

Notes. – Causes strong sharply delimited bleaching. New to Murmansk Region, Asian Russia and the Arctic. *Peltigera leucophlebia* and *P. scabrosa* are new host species.

Specimens Examined. All specimens on upper lobe side of *Peltigera* spp. – **RUSSIA. MURMANSK REGION:** Khibiny Mts., Kukisvumchorr Mt., 67°40'N, 33°41'E, alt. 350 m, stone field in *Betula* forest, on *P. scabrosa*, 15.viii.1997, *MZ 97370* (LE 260060); alt. 500 m, mountain tundra and subalpine vegetation, on *P. leucophlebia*, 15.viii.1997, *MZ 97368* (LE 233885). **KARELIA:** Kesten'ga, bank of Topozero Lake, *Pinus* forest, on *P. rufescens*, 9.vii.1986, *A. Dombrovskaya* (LE 260250). **TAIMYR PEN.:** Byrranga Mts., Zamknutaya River, 74°36'N, 98°35'E, alt. 250 m, rocks in tundra, on *P. leucophlebia*, 24.viii. 1995, *MZ 95488* (LE 233741).

83. *Phoma physciicola* Keissl.

Notes. – In LE 233659:b the species is intimately associated with *Polycoccum pulvinatum*. Conidia in the specimen on *Anaptychia* are (4–)4.5–5.5(–6) × 3–4 µm, l/b = 1.3–1.5(–1.7) (n = 10). New to Russia, Asia and the Arctic. *Anaptychia* is a new host genus and *Physcia caesia* a new host species.

Specimens Examined. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 250 m, rocks in tundra, on *Anaptychia bryorum* (bleached lobes), 28.vii.1995, *MZ 95412* (LE 233409). **CHUKOTKA:** Enmyvaam River, 68°15'N, 166°03'E, boulders in tundra, on *Physcia caesia* (th.), 30.vi.1980, *I. Makarova* (LE 233659:b).

84. *Plectocarpon nephromeum* (Norman) R. Sant.

Notes. – Pathogenicity not observed. New to Komi Republic.

Specimens Examined. All specimens on lobes of *Nephroma* spp. – **CANADA. BRITISH COLUMBIA:** Selkirk Mts., N of Revelstoke, Downie Creek, 51°30'N, 118°20'W,alt. 750 m, coniferous forest, on *Picea* branch, on *N. helveticum*, 21.vii.2002, *MZ 0293* (LE 260094); same region, La Forme Creek, 51°12'N, 118°10'W, alt. 1000 m, mossy rocks in forest, on *N. bellum*, 22.vii.2002, *MZ 0252* (LE 260074). **RUSSIA. KOMI REPUBLIC:** Porub-Kepovskaya, 60°48'N, 49°00'E, *Populus tremula* forest, on *N. bellum*, 26.vii.2001, *T. Pystina* (LE 260034).

85. *Plectocarpon peltigerae* Zhurb., Ertz, Diederich & Miadl.

Notes. – New to Murmansk Region.

Specimen Examined. – **RUSSIA. MURMANSK REGION:** Kovdor, 67°32'N, 30°30'E, mossy rocks in *Betula* forest, on *Peltigera leucophlebia* (upper lobe side), 13.vii.1977, *A. Dombrovskaya* (LE 233958).

86. *Polycoccum bryonthae* (Arnold) Vězda

Notes. – In LE 261785:b and LE 261765:b intimately associated with *Phoma denigricans*. Infected hymenium black and often destroyed. New to North America and the American Arctic, also to Svalbard and Taimyr Pen.

Specimens Examined. All specimens on *Lecanora epibryon* (ap.: hymenium). – **U.S.A. ALASKA:** North Slope, Sagwon, 69°26'N, 148°40'W, alt. 280 m, lichen crusts on frost boil, 7.viii.2003, *D. Walker* (LE 261505). **NORWAY. SVALBARD:** Bünsow Land, Kapp Napier, foot of Teltfjellet Mt., 78°38'N, 16°44'E, alt. 30 m, spotty dwarf shrub-lichen-moss tundra, 19.vii. 2003, *MZ 03225:b* (LE 261785:b). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 250 m, rocks in tundra, 17.viii.1995, *MZ 95557* (LE 261795). **YAKUTIYA:** Lena River delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, dwarf shrub tundra, 28.vii.1998, *MZ 9871:b* (LE 261765:b); lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, 4.viii.1998, *MZ 98398* (LE 261735); Indigirka River, 48 km NNW of Tyubelyakh, 65°48'N, 142°53'E, alt. 250 m, carbonate outcrops in sparse *Larix* forest, 20.vii.1992, *MZ 92563* (LE 261635). **CHUKOTKA:** Baranikha, 68°30'N, 168°16'E, tundra, 21.vi.1971, *I. Makarova* (LE 261535); Iskaten' Range, 66°35'N, 179°10'W, tundra, 29.vi.1971, *I. Makarova* (LE 261736:b); Puoten Bay, 65°50'N, 170°30'W, dwarf shrub tundra, 1.vii.1972, *I. Makarova* (LE 261506:b); Gil'mymlineiveem River, 65°48'N, 173°15'E, *Dryas* tundra, 19.vii.1977, *I. Makarova* (LE 261675).

87. *Polycoccum crassum* Vězda

Notes. – New to Russia and the Arctic. *Peltigera didactyla* is a new host.

Specimens Examined. – **RUSSIA. YAKUTIYA:** Laptevykh Sea coast, 3 km NW of Tiksi, 71°39'N, 128°45'E, alt. 70 m, dwarf shrub tundra, on *Peltigera* sp. (underside of old lobes), 24.viii.1998, *MZ 98350* (LE 233944). **CHUKOTKA:** Penkignei Bay, Pestsovaya River mouth, 64°50'N, 173°10'W, *Salix* shrubs, on *Peltigera extenuata* (upper lobe side, soralia), 2.viii.1978, *A. Katenin* (LE 233748).

88. *Polycoccum pulvinatum* (Eitner) R. Sant

Notes. – LE 233659:a is intimately associated with *Phoma physciicola*. Induces bullate galls on host lobes. New to Asian Russia and the Russian Arctic.

Specimens Examined. All specimens on *Physcia* spp. (th.). – **RUSSIA. POLAR URAL:** Eletz River, 67º02'N, 64º26'E, alt. 100 m, carbonate outcrops among shrub tundra, on *P. caesia*, 29.vi.1993, *MZ 93205* (LE 260172); Rai-Iz Mt., 66º57'N, 65º39'E, alt. 250 m, boulders in sparse *Larix* forest, on *P. caesia*, 27.vi.1993, *MZ 93149:a* (LE 260202:a). **YAKUTIYA:** junction of Indigirka and In'yali Rivers, 65°10'N, 143°10'E, alt. 500 m, stony mountain slope, on *P. albinea*, 18.vi.1976, *I. Makarova* (LE 233341). **CHUKOTKA:** Enmyvaam River, 68°15'N, 166°03'E, boulders in tundra, on *P. caesia*, 30.vi.1980, *I. Makarova* (LE 233659:a).

89. *Polydesmia lichenis* Huhtinen & R. Sant.

Notes. – New to Russia, Asia and the Arctic. Pathogenicity not observed.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, on *Peltigera leucophlebia* (upper side of decaying lobes), *MZ 95441* (LE 233908).

90. *Pronectria erythrinella* (Nyl.) Lowen

Notes. – According to Rossman et al. (1999) ascospores of *Pronectria erythrinella* are (17–)18–20(–30) × (4–)5.5–6(–8) µm, hyaline to pale yellow orange, verruculose. In the material I examined they were (15–)18–26(–32) × (3.5–)5.5–8(–10) µm, l/b = (1.9–)2.7–3.9(–5.1) (n = 111), hyaline, (0–)1-septate, smooth-walled to verruculose. New to Murmansk and Nenetz Regions and Asian Russia.

Specimens Examined. All specimens on *Peltigera* spp. – **RUSSIA. MURMANSK REGION:** Kol'skii Gulf, Vaenga River mouth, 69°04'N, 33°29' E, rocky *Betula* forest, on *P. extenuata* (th.), 22.viii.1971, *A. Dombrovskaya* (LE 233867). **NENETZ REGION:** Bol'shezemel'skaya Tundra, headwaters of Severnaya River, 67º38'N, 54º01'E, *Salix* tundra, on *P. extenuata* (th., occasionally soralia), 14.viii.1996, *O. Lavrinenko* (LE 233967). **BAIKAL SIBERIA:** Khamar-Daban Range, 51°35'N, 105°25'E, Osinovka River, sandy river bank in taiga forest, on *P. didactyla* (moribund lobes), 2.viii.1997, *G. Urbanavichyus* (LE 233971); same range, headwaters of Pereemnaya River, Chernoe Lake, 51°25'N, 105°13'E, taiga forest, on *Peltigera* sp. (th.), 7.viii.1996, *I. Urbanavichene* (LE 233746). **YAKUTIYA:** Lena River delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, on *P. leucophlebia* (decaying th.), 1.viii.1998, *MZ 98331* (LE 233847); 8.viii.1998, *MZ 98330* (LE 233877).

91. *Pronectria minuta* Motiej. & Kukwa

Notes. – Infected portions of podetia are pale rose. New to Asia.

Specimen Examined. – **RUSSIA. SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°26'E, alt. 1400 m, mountain meadow, on *Cladonia arbuscula* s. l. (throughout podetia), 19.vii.2009, *MZ 0921* (LE 260282).

92. *Pronectria robergei* (Mont. & Desm.) Lowen s.l.

Notes. – Santesson (1993: 179) introduced "*Pronectria solorinae* Lowen & R. Sant. (ined.)" from Sweden growing on thalli of *Solorina bispora* and *S. saccata*. The species has not been validly published and is absent from the more recent edition of the Fennoscandian checklist of lichens and lichenicolous fungi (Santesson et al. 2004) and the monograph of nectrioid fungi (Rossman et al. 1999). However, it has subsequently been reported from *Solorina*

spp. in a number of publications (for example: Alstrup et al. 2008: 5, Hafellner 1999: 522, Hafellner et al. 2005, Türk & Berger 1999: 943, Zhurbenko & Santesson 1996: 157). According to the specimens attributed to this species in 1995 by R. Santesson (LE 207390, LE 207391), it is similar to *Pronectria robergei* (typically growing on *Peltigera* spp.), but differs from the latter by narrower ascospores (under 5 µm wide), very pale buff vs. red exposed portions of peridium and restriction to the hymenium of *Solorina* spp. However, examination of additional specimens of "*Pronectria solorinae*" (13 specimens, on *Solorina*) and *P. robergei* s. str. (9 specimens, on *Peltigera*) showed that both have narrow- and wide spored specimens with similar ascospore sizes (Table 3) and hence are provisionally treated here as *P. robergei* s. l. with ascospores (10–)11.5–14.5(–18) × (2.5–)3–6(–8) µm, l/b = (1.5–)2.6–3.8(–6.0) (n = 304). Further studies are needed to verify whether populations with pale buff upper portions of the peridium and narrower ascospores commensalistically growing in hymenium of *Solorina* spp. represent a distinct taxon. New to Arctic Alaska, Taimyr Pen. and Yakutiya.

		on *Solorina*	on *Peltigera*
ascospore size	specimens with spores under 4.5 µm wide	(10–)10.5–13(–15) × (2.5–)3–4(–4.5) µm (9 specimens, n = 94)	(10.5–)12–14(–16) × (2.5–)3–4 (7 specimens, n = 107)
	specimens with spores above 5 µm wide	(11–)12.5–15.5(–18) × (5–)5.5–7.5(–8) (4 specimens, n = 85)	(12–)12.5–15(–17) × 5–5.5(–6.5) (2 specimens, n = 18)
host part		usually hymenium of apothecia, rarely lobes	usually lobes, rarely apothecia
life habit		commensalistic	often clearly pathogenic

Table 3. Some comparative characteristics of *Pronectria robergei* s. l. growing on *Solorina* and *Peltigera*

Specimens Examined. Growing on *Solorina* spp., unless otherwise indicated. – **U.S.A. ALASKA:** North Slope, Sagwon, 69°26'N, 148°40'W, alt. 280 m, lichen crusts on frost boil, on *S. bispora* var. *bispora* (healthy-looking hymenium), 7.viii.2003, *D. Walker* (LE 260067); Kobuk Valley Wilderness, 67°07'N, 159°03'W, alt. 40 m, mixed forest, on *S. bispora* var. *bispora* (damaged hymenium), 9.viii.2000, *MZ 00465* (LE 260277); Great Kobuk Sand Dunes, 67°06 N, 159°01 W, alt. 50 m, lichen heath with sparse *Picea glauca*, on *S. spongiosa* (hymenium), 4.viii.2000, *MZ 00179* (LE 260028). **CANADA. NUNAVUT:** Ellesemere Is., Eureka, 80°06'N, 85°38'W, arctic tundra, on *S. bispora* var. *subspongiosa* (healthy-looking hymenium), 30.vii. 1999, *N. Matveeva* (LE 260160). **RUSSIA. MURMANSK REGION:** Pyukhyakuru River, 66°47'N, 30°00'E, *Betula* forest, on *Peltigera canina* (th.: bleached portions), 12.viii.1986, *T. Dudoreva* (LE 233837). **TAIMYR PEN.:** Byrranga Mts., Zamknutaya River, 74°37'N, 98°33'E, alt. 150 m, rocks in tundra, on *S. bispora* var. *subspongiosa* (healthy-looking lobes and hymenium), 6.viii.1995, *MZ 95474* (LE 233942); *MZ 95475* (LE 233903); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300–500 m, scree tundra, on *S. bispora* var. *subspongiosa* (healthy-looking hymenium), 20.viii.1995, *MZ 95501:b* (LE 260299:b); on *S. bispora* var. *bispora* (healthy-looking hymenium), 22.viii.1995, *MZ 95500* (LE 260260). **YAKUTIYA:** Lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, on *S. bispora* var. *subspongiosa* (healthy-looking hymenium), 4.viii.1998, *MZ 98368* (LE 260100).

Specimens Used for Comparison: On *Solorina* spp.: LE 260039, LE 260080, LE 207390, LE 207391. On *Peltigera* spp.: LE 210351, LE 210237, LE 210361, LE 207388, LE 210498, LE 207389, LE 210346, LE 210259.

93. *Pronectria tenuispora* (D. Hawksw.) Lowen

Notes. – According to Hawksworth (1978) ascospores of this species are 22–28(–33) × 3.5–4(–4.5) µm. In our material they were (16–)22.5–31.5(–36) × (3–)4–5(–6) µm, l/b = (2.7–)5–7.8(–9) (n = 57). Causes local bleaching of host tissues.

Specimens Examined. All specimens on the upper lobe side of *Peltigera occidentalis*. – **RUSSIA. YAKUTIYA:** Lena River delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, 1.viii.1998, *MZ 98332* (LE 233857); same delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, wet lichen-moss tundra, 10.viii.1998, *MZ 98326* (LE 233947); 15.viii. 1998, *MZ 98327* (LE 233767).

94. *Pronectria tibellii* Zhurb.

NOTES. – Causes bleaching of host tissues. New to Asia.

SPECIMEN EXAMINED. – **RUSSIA. SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°27'E, alt. 1400 m, mountain meadow, on *Cladonia* sp. (basal squamules), 8.vii.2009, *MZ 0922* (LE 260072).

95. *Pronectria walkerorum* Zhurb.

NOTES. – New to Russia and Asia. The species was known on *Ochrolechia* sp. and *O. androgyna* (Zhurbenko et al. 2005). *Ochrolechia frigida* is a new host species.

SPECIMEN EXAMINED. – **RUSSIA. YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, rocks among tundra, on *Ochrolechia frigida* (th.), 12.viii.1998, *MZ 98316* (LE 233629).

96. *Pyrenidium actinellum* Nyl. s.l.

NOTES. – Ascospores elliptic to narrowly elliptic, (1–)3-septate, often markedly constricted at the septa, (19–)23–29(–36) × (8–)9–10.5(–13) µm, l/b = (1.9–)2.3–2.9(–3.7) (n = 151, for specimens growing only on *Solorina*), 8 per ascus. Specimens LE 207066, LE 207067, LE 207069, LE 207073, LE 207562:a, and LE 207070:a given below were formerly erroneously reported as *Dacampia engeliana* (Zhurbenko & Santesson 1996). Pathogenicity not observed. New to Vize Is., Severnaya Zemlya, and Yakutiya.

SPECIMENS EXAMINED. Growing on lobes and cephalodia of *Solorina bispora* var. *subspongiosa*, unless otherwise indicated. – **RUSSIA. FRANZ JOSEF LAND:** Hooker Is., 80°20'N, 52°52'E, arctic desert, 24.vii.1930, *V. Savicz* (LE 207075); 2.viii.1930, *V. Savicz* (LE 207066, LE 207067). **Vize Is.:** 79°32'N, 76°50'E, arctic desert, 14.viii.1930, *V. Savicz* (LE 207071); on *Solorina bispora* (th.), 14.viii.1930, *V. Savicz* (LE 207069). **SEVERNAYA ZEMLYA** (arctic desert)**:** Sedov Archipelago W of Oktyabr'skoi Revolutsii Is., Figurnyi Is., 79°25'N, 91°40'E, on *S. bispora* (th.), 24.viii.1930, *V. Savicz* (LE 207072); same Archipelago, Srednii Is., near airport, 79°30'N, 91°20'E, on *S. bispora* (th.), 18.vii.1979, *E. Khodachek* (LE 233853); Bol'shevik Is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 10 m, 21.vii.1996, *MZ 96965* (LE 233723); same is., W coast of Akhmatova Bay, 79°03'N, 102°42'E, alt. 50 m, 16.vii.1996, *MZ 96964* (LE 233913). **TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°08'E, alt. 200 m, rocks in tundra, 10.viii.1994, *MZ 94224* (LE 207073); same mts., Zamknutaya River, 74°37'N, 98°33'E, alt. 150 m, rocks in tundra, 6.viii.1995, *MZ 95473* (LE 233803); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, rocks in tundra, 24.vii.1995, *MZ 95468* (LE 233833); 22.viii.1995, *MZ 95471* (LE 233923); 25.viii.1994, *MZ 94453:a* (LE 207562:a); 25.viii.1994, *MZ 94454:a* (LE 207070:a); E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, carbonate outcrops in tundra, 9.viii.1995, *MZ 95470* (LE 233813); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 120–150 m, rocks in tundra, 30.vii.1995, *MZ 95467* (LE 233933); 1.viii.1995, *MZ 95469* (LE 233883). **YAKUTIYA:** Indigirka River, 8 km SW of Ust'-Nera, 64°31'N, 143°08'E, alt. 1000 m, Dva brata Mt., stone field in subalpine belt, on *Baeomyces carneus* (th.), 23.vii.1992, *MZ 92514:a* (LE 207725:a). **CHUKOTKA:** Bezymyannoe Lake, 66°39'N, 176°40'E, dwarf shrub tundra, on *Peltigera venosa* (th.), 8.vii.1979, *I. Makarova* (LE 233818).

97. *Reconditella physconiarum* Hafellner & Matzer

NOTE. – New to Asian Russia, Asia and the Arctic.

SPECIMEN EXAMINED. – **RUSSIA. CHUKOTKA:** Gil'mymlineiveem River, 65°48'N, 173°15'E, tundra, on *Physconia muscigena* (lobe margins), 19.vii.1977, *I. Makarova* (LE 233448).

98. *Rhagadostoma brevisporum* (Nav.-Ros. & Hladun) Nav.-Ros.

NOTES. – The species has recently been first reported for the Arctic from Greenland (Alstrup et al. 2009). New to Russia, Asia and the Russian Arctic.

SPECIMEN EXAMINED. – **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 5 m, arctic desert, on *Solorina saccata* (margins of decaying lobes), 17.vii.1996, *MZ 96976:a* (LE 233891:a).

99. *Rhagadostoma lichenicola* (De Not.) Keissl.

NOTES. – New to Polar Ural and Yamal-Nenetz Region. *Solorina bispora* is a new host species.

SPECIMENS EXAMINED. All specimens on lobes of *Solorina* spp. (upper and underside by the margins). – **RUSSIA. POLAR URAL:** Rai-Iz Mt., headwaters of Vizuvshor Creek, 66°50'N, 65°05' E, alt. 660 m, *Carex-Salix polaris*-moss tundra, on *S. saccata*, 2.ix.2001, *S. Kholod* (LE 260167). **YAMAL-NENETZ REGION:** Belyi Is., near polar station, 73°18'N, 70°08'E, polygonal tundra, on *S. crocea*, 23.vii.2009, *D. Walker* (LE 261609). **SEVERNAYA ZEMLYA:** Bol'shevik Is., middle Studenaya River, 78°37'N, 101°05'E, alt. 130 m, arctic desert, on *S. saccata*, 15.viii.1998, *N. Matveeva* (LE 233873). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 50 m, tundra, on *S. bispora*, 25.viii.1995, *MZ 95480* (LE 233733).

100. *Rhymbocarpus geographici* (J. Steiner) Vouaux

NOTES. – Pathogenicity not observed. New to Russia and the Arctic.

SPECIMENS EXAMINED. – **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°39'E, alt. 150 m, rocks in sparse *Larix* forest, on *Rhizocarpon geminatum* (th.), 27.vi.1993, *MZ 93110:a* (LE 261709:a). **CHUKOTKA:** Inchoun, 66°15'N, 170°20'W, stony tundra, on *Rhizocarpon* sp. (th.), 29.vii.1975, *I. Makarova* (LE 261629:a).

101. *Rhymbocarpus neglectus* (Vain.) Diederich & Etayo

SPECIMENS EXAMINED. – **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., middle Studenaya River, 78°37'N, 101°05'E, alt. 130 m, arctic desert, on *Lepraria gelida* (th.), 15.viii.1998, *N. Matveeva* (LE 233522).

102. *Roselliniella cladoniae* (Anzi) Matzer & Hafellner

NOTES. – Pathogenicity not observed. New to South Siberia.

SPECIMEN EXAMINED. – **RUSSIA**. **SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°27'E, alt. 1450 m, mountain meadow, on *Cladonia rangiferina* (throughout podetia), 2.vii.2009, *MZ 0916* (LE 260262).

103. *Roselliniella pannariae* Matzer & Hafellner

NOTES. – Pathogenicity not observed. New to Russia, Asia, and the Arctic.

SPECIMENS EXAMINED. Both specimens on thalli of *Protopannaria pezizoides*. – **RUSSIA. TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30 m, *Dryas* tundra, 13.vii.1990, *MZ 90700* (LE 260285); NW coast of Pyasino Lake, N'yapan hills, 70°00'N, 87°30'E, alt. 50 m, shrub tundra, 17.vii.1983, *MZ 83231* (LE 260165).

104. *Roselliniopsis gelidaria* (Mudd) Matzer

NOTE. – Pathogenicity not observed.

SPECIMEN EXAMINED. – **DENMARK. GREENLAND:** Mellem Land, 1 km NE of Narsarsuaq, Signalhojen Mt., 61°10'N, 45°24'W, alt. 120 m, rocks on slope among shrubs, on *Placopsis gelida* (th., cephalodia), 25.vii.2005, *MZ 05295* (LE 260244).

105. *Sagediopsis aspiciliae* (Vain.) Nik. Hoffm. & Hafellner

NOTES. – Pathogenicity not observed. New to Chukotka.

SPECIMENS EXAMINED. – **RUSSIA. POLAR URAL:** Sob' River, 66°59'N, 65°45'E, alt. 300 m, boulders in subalpine belt, on *Aspilidea myrinii* (th.), 17.vii.1986, *MZ 86130* (LE 261515). **CHUKOTKA:** Ioni Lake, 65°53'N, 173°44'W, boulders in tundra, on *Lecidea lapicida* var. *pantherina* (th.), 30.vi.1977, *I. Makarova* (LE 261573).

106. *Sclerococcum montagnei* Hafellner

NOTES. – Pathogenicity not observed. New to Russia, Asia and the Arctic.

SPECIMEN EXAMINED. – **RUSSIA. CHUKOTKA:** Iskaten' Range, 66°35'N, 179°10'W, boulders in tundra, on *Lecanora rupicola* (th., ap.: hymenium), 1.vii.1971, *I. Makarova* (LE 261775).

107. *Scutula epiblastematica* (Wallr.) Rehm

NOTES. – New to the Arctic, Taimyr Pen. and Yakutiya.

SPECIMENS EXAMINED. All specimens on *Peltigera canina* (old/decaying lobes, mostly upper, occasionally lower sides near margins). – **RUSSIA. MURMANSK REGION:** Pyukhyakuru River, 66°47'N, 30°00'E, in *Betula* forest, 12.viii.1986, *T. Dudoreva* (LE 260159) [pathogenicity not observed]. **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, stony tundra, 30.viii.1995, *MZ 95496* (LE 260240) [*Libertiella* state only]. **YAKUTIYA:** junction of Indigirka and In'yali Rivers, 65°10'N, 143°10'E, alt. 500 m, sparse *Larix* forest, 20.vi.1976, *I. Makarova* (LE 233987).

108. *Scutula tuberculosa* (Th. Fr.) Rehm

NOTES. – Conidiomata of *Karsteniomyces* state subglobose, sessile, 75–250 µm diam., pinkish buff to brown or black; conidia hyaline, usually bacilliform and often slightly wider above, rarely very narrowly elliptic or spathulate, straight to occasionally slightly curved, rounded at apex, truncated at base, (0–)1-septate, (8–)12–17(–24) × 2.5–3.5(–4) µm, l/b = (2.5–)3.8–5.8(–8.0) (n = 102). In heavy infections may cause bleaching, otherwise pathogenicity not observed. New to the American Arctic, Polar Ural, Severnaya Zemlya, Taimyr Pen., and Wrangel' Is.

SPECIMENS EXAMINED. All specimens on *Solorina* spp.: on upper side of healthy-looking and old lobes, occasionally on hymenium of apothecia. – **U.S.A. ALASKA:** North Slope, Franklin Bluffs, 69°40'N, 148°40'W, alt. 125 m, frost boil tundra, on *S. bispora*, 28.vi.2002, *D. Walker* (LE 260107). **RUSSIA. POLAR URAL:** Eletz River, 67°02'N, 64°26'E, alt. 100 m, carbonate outcrops among shrub tundra, on *S. bispora*, 28.vi.1993, *MZ 93219* (LE 233753) [*Karsteniomyces* state only]. **SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 20 m, arctic desert, on *S. saccata*, 17.vii.1996, *MZ 96967* (LE 233812) [*Karsteniomyces* state only]. **TAIMYR PEN.:** Byrranga Mts., NW of Levinson-Lessinga Lake, 74°32'N, 98°30'E, alt. 250 m, rocks in tundra, on *S. saccata*, 10.viii.1995, *MZ 95483* (LE 233702); N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 50–300 m, tundra, on *S. bispora* var. *subspongiosa*, 25.viii.1994, *MZ 94454:b* (LE 207070:b); on *S. bispora*, 25.viii.1995, *MZ 95479* (LE 233793) [including *Karsteniomyces* state]. **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Amerika-Khaya hill, 72°35'N, 126°18'E, alt. 50 m, rocks in tundra, on *S. bispora* var. *subspongiosa*, 30.vii.1998, *MZ 98359* (LE 233713); same delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, dwarf shrub tundra, on *S. saccata*, 30.vii.1998, *MZ 98361* (LE 233802); 12.vii.1988, *I. Makarova* (LE 233738) [including *Karsteniomyces* state]; Indigirka River, 48 km NNW of Tyubelyakh, 65°48'N, 142°53'E, alt. 250 m, carbonate outcrops in sparse *Larix* forest, on *S. bispora* var. *subspongiosa*, 20.vii.1992, *MZ 92562* (LE 233972) [*Karsteniomyces* state only]. **WRANGEL' IS.:** Upper Mamontovaya River, 70°14'N, 179°35'E, lichen-moss tundra, on *S. saccata*, 1996, *S. Kholod* (LE 233792) [*Karsteniomyces* state only]. **CHUKOTKA:** Bezymyannoe Lake, 66°39'N, 176°40'E, stony tundra, on *S. saccata*, 8.vii.1979, *I. Makarova* (LE 233708) [including *Karsteniomyces* state]; Gil'mymlineiveem River, 65°48'N, 173°15'E, tundra, on *S. saccata*, 18.vii.1977, *I. Makarova* (LE 233722); 20.vii.1977, *I. Makarova* (LE 233752:a) [rev. D. Triebel, 2004]; Lavrentiya Bay, 65°35'N, 171°00'W, tundra, on *S. saccata*, 11.vii.1973, *I. Makarova* (LE 233718).

109. *Skyttea lecanorae* Diederich & Etayo

NOTES. – Pathogenicity not observed. New to Yakutiya. The species was formerly known only on corticolous *Lecanora* spp. (Diederich & Etayo 2000), terricolous *Lecanora epibryon* is a new host species.

SPECIMEN EXAMINED. – **RUSSIA. YAKUTIYA:** Lena River between Sinsk and Tit-Ary, 61°04'N, 127°29'E, alt. 120 m, carbonate outcrops with steppe-like vegetation, on *Lecanora epibryon* (th., ap.: hymenium, margins), growing on mosses, 5.vii. 1992, *MZ 92564* (LE 261645).

110. *Skyttea tephromelarum* Kalb & Hafellner

NOTES. – New to Asian Russia, Asia and the Arctic. Pathogenicity not observed.

SPECIMEN EXAMINED. – **RUSSIA. YAKUTIYA:** Lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt. 160 m, scree *Dryas* tundra, on *Tephromela atra* (th.), 13.viii.1987, *V. Perfil'eva* (LE 261794:a).

110. *Sphaerellothecium araneosum* (Arnold) Zopf

NOTES. – Pathogenicity not observed. New to Yamal-Nenetz Region.

SPECIMEN EXAMINED. – **RUSSIA. YAMAL-NENETZ REGION:** Belyi Is., 3 km SW of polar station, 73°18'N, 70°08'E, dwarf shrub lichen moss tundra, on *Ochrolechia frigida* (th.), 23.vii.2009, *D. Walker* (LE 261698).

111. *Sphaerellothecium contextum* Triebel

NOTES. – Infected hymenium bleached. New to Taimyr Pen.

SPECIMENS EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200 m, rocks in tundra, on saxicolous *Lecanora* sp. (ap.: hymenium), 26.viii.1995, *MZ 95569:a* (LE 261783:a). **CHUKOTKA:** Puoten Bay, 65°50'N, 170°30'W, stony tundra, on *Protoparmelia badia* (ap.: hymenium), 23.vii.1972, *I. Makarova* (LE 261674).

112. *Sphaerellothecium reticulatum* (Zopf) Etayo, syn. *Echinothecium reticulatum* Zopf

NOTE. – Pathogenicity not observed.

SPECIMENS EXAMINED. – **RUSSIA. TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30–40 m, boulders in dwarf shrub tundra, on *Arctoparmelia separata* (th.), 2.vii.1990, *MZ 90460* (LE 260233); 14.vii.1990, *MZ 90463* (LE 260222); same coast, Osipovka River mouth, 72°42'N, 80°51'E, alt. 40 m, boulders in dwarf shrub tundra, on *Parmelia saxatilis* (th.), 18.vii.1990, *MZ 90519:b* (LE 260092:b).

113. *Stigmidium cerinae* Cl. Roux & Triebel

NOTES. – Causes bleaching of hymenium. New to Severnaya Zemlya.

SPECIMEN EXAMINED. – **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°02'N, 102°42'E, alt. 60 m, arctic desert, on *Caloplaca cerina* (ap.: hymenium), 16.vii.1996, *MZ 96719* (LE 260133).

114. *Stigmidium conspurcans* (Th. Fr.) Triebel & R. Sant.

NOTE. – Pathogenicity not observed.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** lower Pravaya Uboinaya River, "217" Mt., 73°26'N, 82°43'E, alt. 150 m, rocks in dwarf shrub tundra, on *Psora rubiformis* (th.), 5.viii.1990, *MZ 90561:a* (LE 260173:a).

115. *Stigmidium croceae* (Arnold) Cl. Roux & Triebel

NOTES. – On healthy-looking or decaying lobes; partly associated with dark or bleached lobe portions. New to Chukotka. *Solorina saccata* is a new host species.

SPECIMENS EXAMINED. All specimens on *Solorina* spp. – **CANADA. NUNAVUT:** Amund Ringnes Is., 78°25'N 96°45'W, arctic desert, on *S. saccata*, 2.viii.1999, *N. Matveeva* (LE 233901). **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 10 m, arctic desert, on *S. saccata*, 21.vii.1996, *MZ 96970* (LE 233822). **CHUKOTKA:** lower Vetgyvayam River, 66°28'N, 171°12'W, tundra, on *S. bispora*, 10.viii.1991, *I. Makarova* (LE 233992).

116. *Stigmidium mitchellii* Cl. Roux & Bricaud

NOTES. – Asci (35–)36–46(–50) × (11–)12–14(–15) µm (n = 16). Ascospores hyaline, 1-septate, smooth-walled, non-halonate, (10–)11–13.5(–15.5) × (3–)3.5–4(–4.5) µm, l/b = (2.6–)2.9–3.7(–4.7) (n = 62, in water or BCr). Infected host tissues often bleached or dark. Formerly known in Russia only from Karelia, however the identification was uncertain (Zhurbenko & Himelbrant 2002). The species has recently been first reported for the Arctic from Greenland (Alstrup et al. 2009). New to Asia, the Russian Arctic, Svalbard, Murmansk Region and Asian Russia. *Psoroma* is a new host genus.

Specimens Examined. All specimens on healthy-looking or decaying hymenia and thalli of *Protopannaria pezizoides* and *Psoroma hypnorum*. – **NORWAY. SVALBARD:** Nordenskiöld Land, E coast of Grønfjorden, 4 km S of Barentsburg, 78º02'N, 14º19'E, alt. 20 m, spotty dwarf shrub-lichen-moss tundras, on *P. pezizoides*, 13.vii.2003, *MZ 03271* (LE 260175); near Barentsburg, 78º04'N, 14º14'E, alt. 100 m, graminoid-dwarf shrub-lichen-moss tundra, on *P. hypnorum*, 31.vii.2003, *MZ 03205* (LE 260248). **RUSSIA. MURMANSK REGION:** Barents Sea coast, Dal'nie Zelentsy, 69°07'N, 36°05'E, alt. 20 m, dwarf shrub-moss-lichen tundra, on *P. hypnorum*, 22.viii.1997, *MZ 97373* (LE 260298:b); same coast, Olenka River mouth, 69°02'N, 36°25'E, alt. 20 m, shrub tundra, on *P. pezizoides*, 7.ix.1997, *MZ 97376* (LE 260195). **SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, on *P. hypnorum*, 10.vii.1996, *MZ 96992:a* (LE 260177:a); 14.vii.1996, *MZ 96991* (LE 260138); on *P. pezizoides*, 12.vii.1996, *MZ 96994:b* (LE 260227:b); same is., W coast of Akhmatova Bay, 79°03'N, 102°42'E, alt. 60 m, on *P. pezizoides*, 16.vii.1996, *MZ 96997* (LE 260086); same is., Cape Antseva, 78°12'N, 103°17'E, alt. 30 m, on *P. pezizoides*, 1.viii.1997, *N. Matveeva* (LE 260186); 21.viii.1998, *N. Matveeva* (LE 260096); 31.vii.2000, *N. Matveeva* (LE 260235); on *P. hypnorum*, 12.viii.1997, *N. Matveeva* (LE 260098); 28.vii.2000, *N. Matveeva* (LE 260078); 17.viii.2000, *N. Matveeva* (LE 260288). **TAIMYR PEN.:** Uboinaya River mouth, 73°36'N, 82°22'E, alt. 10 m, polygonal loamy tundra, on *P. hypnorum*, 11.viii.1990, *MZ 90724* (LE 260127). **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Amerika-Khaya hill, 72°35'N, 126°18'E, alt. 50 m, rocks in tundra, on *P. hypnorum*, 30.vii.1998, *MZ 98384* (LE 260178). **WRANGEL' IS.:** Pik Tundrovyi cabin, 71°19'N, 179°50'W, alt. 100m, on *P. pezizoides*, 22.viii.1995, *S. Kholod* (LE 260255). **CHUKOTKA:** Lavrentiya Bay, 65°35'N, 171°00'W, *Salix* shrubs in tundra, on *P. pezizoides*, 24.viii.1975, *I. Makarova* (LE 260036).

117. *Stigmidium peltideae* (Vain.) R. Sant. s.l.

Notes. – Ascospores hyaline, 1-septate, (8.5–)11–13.5(–17) × (3–)3.5–4.5(–5) µm, l/b = (2.0–)2.7–3.5(–4.3) (n = 263, in BCr or water), smooth-walled, non-halonate. Endoascus and spore wall BCr+ violet. In the examined specimens I failed to distinguish *Stigmidium leucophlebiae* Cl. Roux & Triebel ad int. (restricted to *Peltigera leucophlebia*) from *S. peltideae*. The species are supposed to have asci and ascospores of different sizes (Roux & Triebel 1994). However, there was almost no difference in ascospore size between specimens on *Peltigera leucophlebia* [(10–)11–13(–15) × (3–)3.5–4.5(–5) µm (n = 94, in BCr or water)] and on the other host species [(8.5–)11–13.5(–17) × (3–)3.5–4.5(–5) µm (n = 169, in BCr or water)]. Causes bleaching/darkening of host tissues. New to Canadian Arctic, Murmansk and Yamal-Gydan Regions, Severnaya Zemlya, and Yakutiya. *Peltigera continentalis* is a new host species.

Specimens Examined. – All specimens on *Peltigera* spp.: on mostly old/decaying lobes (upper side and underside of raised lobe margins), occasionally on cephalodia and corticated underside of apothecia. **CANADA. NUNAVUT:** Ellesemere Is., Eureka, 80°06'N, 85°38'W, arctic tundra, on *P. venosa*, 30.vii.1999, *N. Matveeva* (LE 233921); Amund Ringnes Is., 78°25'N 96°45'W, arctic desert, on *P.* cf. *malacea*, 2.viii.1999, *N. Matveeva* (LE 233801:a). **RUSSIA. MURMANSK REGION:** Pyukhyakuru River, 66°47'N, 30°00'E, alt. 240 m, rocks in *Betula* forest, on *P. venosa*, 1.vii.1972, *A. Dombrovskaya* (LE 260130:b). **GYDAN PEN.:** Eniseyskii Gulf coast, Leskino, 72°20'N, 79°30'E, tundra, on *P. leucophlebia*, 15.viii.1972, *R. Yunak & G. Prokop'eva* (LE 233931). **TROINOI IS. IN KARSKOE SEA:** 75°57'N, 82°56'E, alt. 20 m, polygonal *Salix polaris*-moss tundra, on *P. canina*, 17.vii.1992, *Yu. Kozhevnikov* (LE 233721). **SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, on *P. elisabethae*, 10.vii.1996, *MZ 96981* (LE 260230); on *P. leucophlebia*, 12.vii.1996, *MZ 96979* (LE 260099); 13.vii.1996, *MZ 96978* (LE 233781); on *P. venosa*, 13.vii.1996, *MZ 96983* (LE 260109); on *P. elisabethae*, 14.vii.1996, *MZ 96982* (LE 260049); same is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 10 m, on *P. leucophlebia*, 21.vii.1996, *MZ 96984* (LE 260139); *MZ 96485:a* (LE 260089:a); same is., W coast of Akhmatova Bay, 79°02–04'N, 102°41–45'E, alt. 10–60 m, on *P. leucophlebia*, 15.vii.1996, *MZ 96977* (LE 233831); 16.vii.1996, *MZ 96955:a* (LE 233794:a); 17.vii.1996, *MZ 96974* (LE 233951); 18.vii.1996, *MZ 96972* (LE 233771); Zhurbenko *96328:a* (LE 233841:a); same is., Cape Antseva, 78°12'N, 103°17'E, alt. 30 m, on *P. venosa*, 28.vii.2000, *N. Matveeva* (LE 210326) [formerly erroneously reported as *Stigmidium leucophlebiae* (Zhurbenko 2008)]. **TAIMYR PEN.:** Byrranga Mts., Zamknutaya River, 74°36–37'N, 98°33–35'E, alt. 150–250 m, rocks in tundra, on *P. didactyla*, 6.viii.1995, *MZ 95497* (LE 260029); on *P. continentalis*, 24.viii.1995, *MZ 95489:a* (LE 233981:a); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 50–500 m, stony tundra, on *P.* sp. (th.), 23.viii.1994, *MZ 94370* (LE 207559) [formerly erroneously reported as *Stigmidium* cf. *pseudopeltideae* (Zhurbenko & Santesson 1996)]; on *P. rufescens*, 20.vii.1995, *MZ 95499* (LE 260219); on *P. leucophlebia*, 22.vii.1995, *MZ 95485* (LE 233991); on *P.* sp., 20.viii.1995, *MZ 95498* (LE 260079); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 250 m, rocks in tundra, on *P. leucophlebia*, 28.vii.1995, *MZ 95487* (LE 233911). **ALTAI MTS.:** Yuzhno-Chuiskii Range, Tara River, "3425 m" Mt., 49º42'N, 88º14'E, alt. 3000 m, mountain tundra, on *P. venosa*, 26.vii.1999, *E. Davydov* 2325 (LE 260289) [previously erroneously reported as *Stigmidium* cf. *pseudopeltideae* (Zhurbenko & Davydov 2000)]. **YAKUTIYA:** Lena River delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, *Dryas* tundra, on *P. leucophlebia*, 27.vii.1998, *MZ 98353* (LE 233962); same delta, Kurungnaakh-Sise Is., 72°20 N, 126°18 E, alt. 40 m, lichen-moss tundra, on *P. leucophlebia*, 1.viii.1998, *MZ 98363* (LE 233862); 8.viii.1998, *MZ 98362* (LE 233701); on *P. rufescens*, 8.viii.1998, *MZ 98364* (LE 260059); Laptevykh Sea coast, near Tiksi, 71°39–40'N, 128°40–45'E, alt. 50–70 m, dwarf shrub tundra, on *P. rufescens*, 17.vii.1998, *MZ 98365* (LE 260050); on *P. leucophlebia*, 24.viii.1998, *MZ 98348:a* (LE 233874:a). **CHUKOTKA:** Baran'e Lake, 66°54'N, 175°15'E,

pebbly tundra, on *P. venosa*, 24.vii.1980, *I. Makarova* (LE 260300); Amguema River at 174 km of the road Egvekinot-Iul'tin, 67°41'N, 178°35'W, dwarf shrub tundra, on *P. venosa*, 17.viii.1979, *I. Makarova* (LE 260169); Inchoun, 66°15'N, 170°20'W, dwarf shrub tundra, on *P. leucophlebia*, 2.viii.1975, *I. Makarova* (LE 233821); Ioni Lake, 65°53'N, 173°44'W, *Dryas* tundra, on *P. leucophlebia*, 7.vii.1977, *I. Makarova* (LE 233871); Loren River, 65°40'N, 171°50'W, scree tundra, on *P. polydactylon*-group, 13.viii.1972, *I. Makarova* (LE 260239); Anadyr' Bay, lower Kurupka River, 64°45'N, 174°05'W, dwarf shrub tundra, on *P. leucophlebia*, 29.vii.1987, *A. Katenin* (LE 233961); junction of Chegitun' and Khesmymken Rivers, 66°20'N, 171°48'W, dwarf shrub-lichen-moss tundra, on *P. venosa*, 21.viii.1982, *A. Katenin* (LE 260200).

118. *Stigmidium pseudopeltideae* Cl. Roux & Triebel

Notes. – Ascospores hyaline to rarely pale olive brown, 1(–3)-septate [Roux & Triebel (1994) reported just 1-septate spores], (9–)9.5–12.5(–15) × (2–)3–4.5(–5) µm, l/b = (2.3–)2.6–3.4(–4.5) (n = 74, in BCr or water), smooth-walled, sometimes with thin halo. Endoascus and spore wall BCr-. Infected host parts sometimes bleached. New to Murmansk Region, Severnaya Zemlya, Chukotka, and Kuril'skie Is. *Peltigera degenii* and *P. elisabethae* are new host species.

Specimens Examined. All specimens on mostly old/decaying lobes of *Peltigera* spp.: upper side, occasionally raised underside near margins. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Olenka Rriver mouth, 69°02'N, 36°25'E, alt. 20 m, shrub tundra, on *P. degenii*, 7.ix.1997, *MZ 97369* (LE 233861); Lavnatundra Mt., 68°28', 30°00'E, mixed forest, on *P. canina*, 29.vii.1987, *T. Dudoreva* (LE 260110); Pyukhyakuru River, 66°47'N, 30°00'E, alt. 230 m, stone field in forest, on *P. aphthosa*, 1.vii.1972, *A. Dombrovskaya* (LE 233751:b); Girvas Lake, Noda River mouth, 67°45'N, 30°20'E, *Picea* forest, on *P. canina*, 16.vii.1977, *A. Dombrovskaya* (LE 260030); Khibiny Mts., Vud'yavrchorr Mt., 67°39'N, 33°38'E, alt. 500 m, *Betula* krummholz, on *P. aphthosa*, 22.vii.1960, *A. Dombrovskaya* (LE 233711); same mts., Umbozero Lake, Cape Tul'inyark, 67°46'N, 34°16'E, alt. 160 m, forest, on *P. canina*, 4.viii.1973, *A. Dombrovskaya* (LE 233851); Kandalakshskii Gulf of White Sea, Velikii Is., Cape Korozhnyi, 66°31'N, 33°31'E, *Picea* forest, on *P. canina*, 1.ix.1964, *T. Piin* (LE 260070). **ALTAI MTS.:** headwaters of Sentelek River, Teploe Lake, 51°03'N, 83°38'E, alt. 1400 m, on *P. aphthosa*, 18.viii.1996, *E. Davydov 2326* [this find was reported as "cf." in Zhurbenko & Davydov (2000) due to occasionally 2–3-septate ascospores, but is confirmed here]. **SVERDRUPA IS. IN KARSKOE SEA:** 74°33'N, 79°25'E, alt. 20 m, mossy tundra, on *P. canina*, 1992, *Yu. Kozhevnikov* (LE 233881). **SEVERNAYA ZEMLYA:** Bol'shevik Is., between Shokal'skogo Strait and Mikoyana Bay, 79°17'N, 101°50'E, alt. 40 m, arctic desert, on *P. elisabethae*, 20.vii.1996, *MZ 96988* (LE 260259); on *P. rufescens*, 20.vii.1996, *MZ 96987* (LE 260199). **CHUKOTKA:** Anadyr' Bay, lower Kurupka River, 64°45'N, 174°05'W, *Salix* tundra, on *P. canina*, 8.viii.1987, *A. Katenin* (LE 260040). **KURIL'SKIE IS.:** Kunashir Is., Saratovka River, 44°16'N, 146°06'E, on base of *Abies*, on *P. polydactylon*, 12.ix. 1989, *I. Makarova* (LE 233731); Shikotan Is., road to Cape Krai Sveta, 43°50'N, 146°50'E, *Picea* forest, on *P. degenii*, 30.vii. 1981, *A. Dombrovskaya* (LE 233941).

119. *Stigmidium psorae* (Anzi) Hafellner

Notes. – The first verified report for Russia and on *Psorula*.

Specimen Examined. – **RUSSIA. YAKUTIYA:** junction of Indigirka and In'yali Rivers, 65°10'N, 143°10'E, alt. 450 m, rocks in sparse *Larix* forest, on *Psorula rufonigra* (th.), 20.vi.1976, *I. Makarova* (LE 232161, herb. Diederich) [rev. P. Diederich, 1999].

120. *Stigmidium pumilum* (Lettau) Matzer & Hafellner

Notes. – Ascospores hyaline, 1-septate, (9–)10–11.5(–13) × (3.5–)4–5(–6) µm, l/b = (1.8–)2.2–2.8(–3.0) (n = 63), occasionally evidently halonate. Endoascus and spore wall BCr-. Host lobes become discolored grey or darker in heavy infections. New to Asian Russia. *Physcia albinea* is a new host species.

Specimens Examined. Growing on lobes of *Physcia caesia*, unless otherwise indicated. – **RUSSIA. KARELIA:** coast of Kandalakshskii Gulf of White Sea opposite Velikii Is., Biological Station of Moscow University, 66°34'N, 33°08'E, rocks among forest, 16.viii.1964, *A. Dombrovskaya* (LE 233529). **POLAR URAL:** Eletz River, 67°02'N, 64°26'E, alt. 100 m, carbonate outcrops among shrub tundra, 29.vi.1993, *MZ 93196* (LE 260112); Rai-Iz Mt., 66°57'N, 65°39'E, alt. 250 m, boulders in sparse *Larix* forest, 27.vi.1993, *MZ 93149:b* (LE 260202:b); alt. 150 m, rocks in sparse *Larix* forest, on *Physia albinea* (th.), 27.vi.1993, *MZ 93113* (LE 260091). **TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30 m, boulders in dwarf shrub tundra, 3.vii.1990, *MZ 90513* (LE 260192); Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, rocks in tundra, 22.viii.1995, *MZ 95422* (LE 233468). **SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°27'E, alt. 1400 m, mossy boulder in mountain meadow, 7.vii.2009, *MZ 0936:a* (LE 260062:a); on *P. dubia* (th.), 8.vii.2009, *MZ 0937* (LE 260221). **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Amerika-Khaya hill,

72°35'N, 126°18'E, alt. 50 m, rocks in tundra, 30.vii.1998, *MZ 98317* (LE 233291). **CHUKOTKA:** Enmyvaam River, 68°15'N, 166°03'E, stony tundra, 30.vi.1980, *I. Makarova* (LE 233679); Baran'e Lake, 66°54'N, 175°15'E, boulders in tundra, 21.vii. 1980, *I. Makarova* (LE 233408); Bezymyannoe Lake, 66°39'N, 176°40'E, stony tundra, 7.vii.1979, *I. Makarova* (LE 233609); Lorino, 65°29'N, 171°43'W, stony tundra, 6.vii.1972, *I. Makarova* (LE 233579).

121. *Stigmidium schaereri* (A. Massal.) Trevis.

Note. – New to Wrangel' Is.

Specimen Examined. – **RUSSIA. WRANGEL' IS.:** Gusinaya River, 71°08'N, 179°10'E, tundra, on *Dacampia hookeri* (th.), 2 VIII 1991, *S. Kholod* (LE 260234).

122. *Stigmidium solorinarium* (Vain.) D. Hawksw.

Notes. – Ascospores hyaline to medium olive brown, 1(–3)-septate, (8.5–)10–13.5(–16) × (2.5–)3–4(–4.5) µm, l/b = (2.1–)2.8–4.0(–5.0) (n = 98, in BCr or water), smooth-walled, sometimes with thin halo. Endoascus and spore wall BCr-. Causes bleaching/darkening of host tissues. New to North America and the American Arctic, also to Nenetz Region, Severnaya Zemlya, Yakutiya, and Kyrgyzstan.

Specimens Examined. All specimens on often decaying lobes, sometimes on hymenium, of *Solorina* spp. – **U.S.A. ALASKA:** North Slope, Franklin Bluffs, 69°40'N, 148°43'W, alt. 125 m, dwarf shrub-moss tundra with frostboils, on *S. bispora*, 23.viii.2001, *D. Walker* (LE 260187); 5.viii.2003, *D. Walker* (LE 260057); Brooks Range foothills, Sagwon Hills, 69°26'N, 148°40'W, alt. 280 m, frost boil tundra, on *S. bispora*, 30.vi.2002, *D. Walker* (LE 260197); Kobuk Valley Wilderness, 67°07'N, 159°03'W, alt. 40 m, mixed forest, on *S. bispora*, 9.viii.2000, *MZ 00198:a* (LE 260256:a). **CANADA. NUNAVUT:** Axel Heiberg Is., Bunde Fjord, 80°30'N, 94°36'W, *Dryas* tundra, on *S. bispora*, 1.viii.1999, *N. Matveeva* (LE 233952); Victoria Is., Cambridge Bay, 69°12'N, 104°46'W, xeric *Dryas* barren, on *S. bispora*, 25.vii.1999, *W. Gould* (LE 233782). **RUSSIA. NENETZ REGION:** Malozemel'skaya Tundra, Seduiyakha River, 68°23'N, 53°15'E, *Betula nana*-moss tundra, on *S. saccata*, 3.viii.1998, *O. Lavrinenko* (LE 233772). **NORTHERN URAL:** junction of Pechora and Shezhim Rivers, 62°05'N, 58°25'E, alt. 200 m, carbonate outcrops in spruce forest, on *S. saccata*, 7.vii.1997, *MZ 9783* (LE 260137). **SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 5–20 m, arctic desert, on *S. saccata*, 17.vii.1996, *MZ 96976:b* (LE 233891:b); *MZ 96968* (LE 233732). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 50–300 m, rocks in tundra, on *S. bispora* var. *subspongiosa*, 25.viii.1994, *MZ 94453:b* (LE 207562:b); on *S. saccata*, 20.viii.1995, *MZ 95476:b* (LE 233893:b); on *S. bispora*, 25.viii.1995, *MZ 95477:a* (LE 233863:a). **YAKUTIYA:** Lena River delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, dwarf shrub tundra, on *S. saccata*, 12.vii.1988, *I. Makarova* (LE 260117:b); Lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.20 m, dwarf shrub-moss tundra, on *S. bispora*, 14.viii.1987, *V. Perfil'eva* (LE 233852); Indigirka River, 48 km NNW of Tyubelyakh, 65°48'N, 142°53'E, alt. 250 m, carbonate outcrops in sparse *Larix* forest, on *S. bispora* var. *subspongiosa*, 20.vii.1992, *MZ 92561* (LE 233872). **CHUKOTKA:** Gil'mymlineiveem River, 65°48'N, 173°15'E, tundra, on *S. bispora*, 18.vii.1977, *I. Makarova* (LE 233932); Inchoun, 66°15'N, 170°20'W, tundra, on *S. bispora* var. *subspongiosa*, 9.viii.1975, *I. Makarova* (LE 260280); Lavrentiya Bay, 65°35'N, 171°00'W, dwarf shrub tundra, on *S. bispora*, 10.vii.1973, *I. Makarova* (LE 233892); on *S. bispora* var. *subspongiosa*, 16.vii.1973, *I. Makarova* (LE 233832); Sireniki, 64°24'N, 173°54'W, tundra, on *S. saccata*, 17.vii. 1983, *I. Makarova* (LE 233982). **KYRGYZSTAN. CENTRAL TYAN'-SHAN':** Kuilyu River valley, 42°10'N, 78°50'E, alt. 3300 m, mountain forest, on *S. saccata*, 27.vii.1979, *L. Bredkina 2924* (LE 233842).

123. *Stigmidium squamariae* (de Lesd.) Cl. Roux & Triebel

Notes. – Infected hymenium becomes dark. New to Russia and the Arctic.

Specimens Examined. All specimens in hymenium of *Lecanora* spp. – **RUSSIA. YAKUTIYA:** Indigirka River, Predporozhnyi, 65°00'N, 143°00'E, alt. 400 m, stones in steppe-like vegetation, on *L. muralis*, 27.vi.1976, *I. Makarova* (LE 261613). **CHUKOTKA:** Bezymyannoe Lake, 66°39'N, 176°40'E, stones in steppe-like vegetation, on *L. polytropa*, 11.vii.1979, *I. Makarova* (LE 261625); junction of Anadyr' and Karval'yanskaya Rivers, 65°50′N, 169°55′E, on *L. polytropa*, 31.vii.1982, *O. Afonina* (LE 261533).

124. *Stigmidium tabacinae* (Arnold) Triebel

Notes. – Pathogenicity not observed. New to the American Arctic.

Specimen Examined. – **CANADA. NORTHWEST TERRITORIES:** Banks Is., Green Cabin, 73°13'N, 119°33' W, alt. 75 m, frost boil tundra, on *Toninia sedifolia* (th.), 8.vii.2003, *D. Walker* (LE 260143).

125. *Taeniolella diederichiana* Etayo & Calatayud

Notes. – Pathogenicity not observed. The species was recently described on *Placopsis* sp. from South America and was further known only from Canary Islands and Chukotka (Etayo & Calatayud 2005, Zhurbenko 2009a). New to Greenland.

Specimen Examined. – **DENMARK. GREENLAND:** Mellem Land, 1 km NE of Narsarsuaq, Signalhojen Mt., 61°10'N, 45°24'W, alt. 120 m, rocks on slope among shrubs, on *Placopsis gelida* (th.), 25.vii.2005, *MZ 05296* (LE 260144).

126. *Taeniolella pertusariicola* D. Hawksw. & H. Mayrhofer

Specimens Examined. – **RUSSIA. YAKUTIYA:** Lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, on *Pertusaria bryontha* (ap.), 4.viii.1998, *MZ 98378* (LE 260038).

127. *Tetramelas phaeophysciae* A. Nordin & Tibell

Notes. – Sometimes considered as a scarcely lichenized species. Ascospores olive brown, verruculose, 1(–3)-septate, straight to curved, (15–)17–25.5(–30) × (5.5–)7–9(–12) µm, l/b = (1.7–)2.2–3.2(–4.3) (n = 72). According to Nordin & Tibell (2005) *Tetramelas phaeophysciae* mainly differs from *T. pulverulentus* by the 1-septate vs. 3-septate ascospores, which are also usually curved. However, in the examined materials this distinction occurred only as a tendency, but the ascospores of *T. phaeophysciae* seem to be somewhat longer compared with *T. pulverulentus*. Host thallus occasionally slightly bleached under infection. New to the Russian Arctic, Murmansk Region and Taimyr Pen.

Specimens Examined. Growing on lobes of *Physia caesia*, unless otherwise indicated. – **RUSSIA. MURMANSK REGION:** Ponoi, 67°04'N, 41°06'E, alt. 60 m, rocks, 12.viii.1968, *A. Dombrovskaya* (LE 233479). **POLAR URAL:** Rai-Iz Mt., 66°56'N, 65°35'E, alt. 600 m, rocks in mountain tundra, 26.vi.1993, *MZ 9357* (LE 260032) [formerly reported as *Buellia pulverulenta* (Zhurbenko 2002)]; same mt., 66°57'N, 65°39'E, alt. 250 m, boulders in sparse *Larix* forest, 27.vi.1993, *MZ 93144* (LE 260232). **TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30 m, boulders in dwarf shrub tundra, 3.vii.1990, *MZ 90515:a* (LE 260081:a); Byrranga Mts., Bol'shaya Bootankaga River, 74°20'N, 98°05'E, alt. 110 m, rocks in dwarf shrub tundra, 10.vii.1991, *V. Kuvaev* (LE 260121); same mts., S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 50 m, pebbly tundra, on *Phaeophyscia sciastra* (th.), 31.vii.1995, *MZ 95421* (LE 233251). **PUTORANA PLATEAU:** Kapchuk Lake, rocks in *Larix* forest, on *P. sciastra* (th.), 2.viii.1982, *A. Titov* (LE 206967) [formerly reported as *Buellia pulverulenta* (Zhurbenko & Hafellner 1999: 73)].

128. *Tetramelas pulverulentus* (Anzi) A. Nordin & Tibell

Notes. – Sometimes considered as a scarcely lichenized species. Ascospores olive brown, verruculose, (1–)3-septate, straight to curved, (12–)16–20(–23) × (6–)7–8.5(–9) µm, l/b = (1.5–)2.0–2.8(–3.5) (n = 102). Causes bleaching of host tissues. New to Novaya Zemlya and mainland Yakutiya.

Specimens Examined. Growing on lobes of *Physconia muscigena*, unless otherwise indicated. – **RUSSIA. MURMANSK REGION:** Kandalakshskii Gulf of White Sea, Cape Turii, 66°32'N, 34°30'E, coastal rocks, 29.vii.1967, *A. Dombrovskaya* (LE 233201:a). **NOVAYA ZEMLYA:** Russkaya Gavan' Bay, polar station, 76°14'N, 62°39'E, 1997, *V. Shevchenko* (LE 233261). **SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 10 m, 21.vii.1996, *MZ 96946:b* (LE 233489:b); same is., W coast of Akhmatova Bay, 79°01'N, 102°43'E, alt. 60 m, 16.vii.1996, *MZ 96945* (LE 233231); same is., middle Studenaya River, 78°37'N, 101°05'E, alt. 130 m, 16.viii.1998, *N. Matveeva* (LE 233321). **TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30 m, boulders in dwarf shrub tundra, on *Physcia dubia* (th.), 3.vii.1990, *MZ 90577* (LE 260182); 14.vii.1990, *MZ 90516* (LE 260191); same coast, Osipovka River mouth, 72°42'N, 80°51'E, alt. 40 m, boulders in dwarf shrub tundra, 18.vii.1990, *MZ 90519:a* (LE 260092:a); Byrranga Mts., Zamknutaya River, 74°37'N, 98°33'E, alt. 150 m, rocks in tundra, 6.viii.1995, *MZ 95410:a* (LE 233351); same mts., Krasnaya River, 74°35'N, 98°28'E, alt. 160 m, rocks in tundra, 12.viii.1995, *MZ 95414* (LE 233619); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200–300 m, rocks in tundra, 22.vii.1995, *MZ 95406* (LE 233301); 22.viii.1995, *MZ 95420* (LE 233669); *MZ 95418* (LE 233639); 26.viii.1995, *MZ 95408* (LE 233271); on *Anaphychia ciliaris* s. l. (th.), 20.viii.1995, *MZ 95530* (LE 261538); W of Levinson-Lessinga Lake, 74°30'N, 98°30'E, alt. 120 m, rocks in tundra, 27.viii.1995, *MZ 95416* (LE 233699); E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, carbonate outcrops in tundra, 9.viii.1995, *MZ 95413* (LE 233311); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 50 m, pebbly tundra, 31.vii.1995, *MZ 95417* (LE 233649); same mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 150–250 m, rocks in tundra, 15.viii.1995, *MZ 95415* (LE 233599); *MZ*

95407 (LE 233241); 17.viii.1995, *MZ 95409:a* (LE 233549:a). **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Amerika-Khaya hill, 72°35'N, 126°18'E, alt. 50 m, rocks in tundra, 30.vii.1998, *MZ 98319* (LE 233589); same delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, rocks among tundra, 12.viii.1998, *MZ 98315* (LE 233361); Laptevykh Sea coast, near Tiksi, 71°39–40'N, 128°40–44'E, alt. 50–100 m, scree dwarf shrub tundra, 17.vii.1998, *MZ 98318* (LE 233281); 24.viii.1998, *MZ 98321* (LE 233519). **CHUKOTKA:** Gil'mymlineiveem River, 65°48'N, 173°15'E, stony tundra, 18.vii.1977, *I. Makarova* (LE 233211); Lavrentiya Bay, 65°35'N, 171°00'W, tundra on carbonate outcrops, 21.vii.1973, *I. Makarova* (LE 233449); junction of Chegitun' and Khesmymken Rivers, Isseten Mts., 66°20'N, 171°48'W, tundra on carbonate outcrops, 29.viii.1982, *A. Katenin* (LE 233221).

129. *Tremella christiansenii* Diederich

Notes. – Induces galls, otherwise pathogenicity not observed. New to Russia, Asia and the Arctic. *Physcia dubia* is a new host species.

Specimen Examined. – **RUSSIA. CHUKOTKA:** Bezymyannoe Lake, 66°39'N, 176°40'E, stony tundra, on *Physcia dubia* (th.), 8.vii.1979, *I. Makarova* (LE 233578) [rev. V. Malysheva, 2009].

130. *Tremella cladoniae* Diederich & M.S. Christ.

Specimens Examined. – **BELARUS'. BREST REGION:** near Logishin, 52°20'N, 26°00'E, in lichen *Pinus* forest, on *Cladonia* sp. (podetia), 21.iv.1989, *V. Golubkov* (LE 260146). **UKRAINE. CARPATHIAN MTS.:** near Kostrino, 48°56'N, 22°35'E, *Quercus* forest, on *Cladonia* sp. (basal squamules, podetia) on mossy base of *Acer*, 25.v.1999, *V. Golubkov* (LE 260126); coniferous forest, on *Cladonia* sp. (basal squamules, podetia) on *Alnus glutinosa* base, 27.v.1999, *V. Golubkov* (LE 260046).

131. *Trichosphaeria lichenum* P. Karst. & Har.

Notes. – Ascomata black, subglobose, occasionally collapsed when old, (30–)50–75(–100) µm diam., ¼ immersed to sessile, setose. Setae 20–45(–80) × 3–4 µm. Interascal filaments well-developed, scarcely branched, ca. 1 µm diam. Asci bitunicate, narrowly elliptic, subcylindrical, lanceolate or obclavate, with short foot, (25–)30–40(–50) × 7–9(–11) µm (n = 41, in water or I), 8-spored, plasma I+ orange-yellow. Ascospores hyaline, narrowly elliptic to narrowly slipper-shaped, apices more or less rounded, 1-septate, cells almost equal or with usually the upper cell slightly broader than the lower one, not or rarely slightly constricted at the septum, (6–)7.5–10.5(–14) × 2–3(–4) µm, l/b = (2.4–)2.9–4.1(–5.5) (n = 89, in water or I), smooth-walled, non-halonate, mostly irregularly biseriate in an ascus. Sometimes grows in mixed infections with the macroscopically similar *Niesslia peltigericola*. However, it can be distinguished from the latter by its commensalistic habit, frequent disposition on the lobe underside, presence of interascal filaments, smaller ascomata, asci and ascospores, and rounded vs. acute spore apices. The fungus was previously characterized by ascomata c. 100 µm diam., setae 60–90 µm long, asci ca. 45 × 6–7 µm, ascospores fusiform, 6–9 × 2 µm, simple (? to 1-septate) (Hawksworth 1980, Saccardo 1891). New to Russia, Asia and the Arctic. *Peltigera aphthosa, P. leucophlebia, P. malacea, and P. scabrosa* are new host species.

Specimens Examined. – All specimens on *Peltigera* spp.: on both sides of healthy-looking and decaying lobes, on cephalodia and occasionally rhizines. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Dal'nie Zelentsy, 69°07'N, 36°05'E, alt. 20 m, dwarf shrub-moss-lichen tundra, on *P. scabrosa*, 22.viii.1997, *MZ 97365* (LE 233795); 15 km NE of Murmansk, 69°05'N, 32°50'E, alt. 100 m, in *Betula tortuosa* forest, on *P. aphthosa*, 13.vii.1978, *A. Dombrovskaya* (LE 207598) [previously published as cf. *Niesslia peltigericola* (Zhurbenko 2001)]; Tuloma River, Padun, 68°35'N, 31°50'E, *Pinus* forest, on *P. aphthosa*, 30.viii.1971, *A. Dombrovskaya* (LE 233895:b); Kutu-Ioki River N of Alakurtti, 67°00'N, 30°24'E, *Pinus* forest, on *P. leucophlebia*, 29.vii.1971, *A. Dombrovskaya* (LE 233935); Pyukhyakuru River, 66°47'N, 30°00'E, on *P. leucophlebia*, 5.viii. 1986, *T. Dudoreva* (LE 233705); SE of Vuori-Yarvi Lake, 66°47'N, 30°11'E, *Betula-Picea* forest, on *P. leucophlebia*, 2.viii. 1986, *T. Dudoreva* (LE 233985); Niva-Yarvi Lake, 66°44'N, 29°56'E, stony *Pinus* forest, on *P. leucophlebia*, 3.viii.1986, *T. Dudoreva* (LE 233975); Khibiny Mts., Paachiiok River valley, 67°42'N, 33°38'E, alt. 500 m, mountain tundra, on *P. malacea*, 8.viii.1997, *MZ 97367* (LE 233865); same mts., Kukisvumchorr Mt., 67°40'N, 33°41'E, alt. 500 m, mountain tundra and subalpine vegetation, on *P. leucophlebia*, 15.viii.1997, *MZ 97366* (LE 233955); alt. 350 m, sparse birch forest, abundant on *P. scabrosa*, 14.viii.1997, *MZ 975* (LE 207602) [previously published as cf. *Niesslia peltigericola* (Zhurbenko 2001)]; same mts., Vud'yavrchorr Mt., 67°39'N, 33°38'E, alt. 500 m, *Betula* krummholz, on *P. leucophlebia*, 4.viii.1969, *A. Sulyalina* (LE 233745:b); same mts., Yuksporr Mt., 67°38'N, 33°45'E, alt. 500 m, sparse *Pinus-Betula* forest, on *P. polydactylon*, 24.vi.1962, *A. Dombrovskaya* (LE 233965); Kandalakshskii Gulf of White Sea, Velikii Is., Marfin navolok, 66°34'N, 33°18'E, *Picea* forest, on *P. aphthosa*, 24.vi.1951, *N. Parfent'eva* (LE 233917:b). **NORTHERN URAL:** headwaters of the Pechora River,

Yanypupuner Range, "981" Mt., 62°05'N, 59°06'E, alt. 800 m, dwarf shrub tundra, on *P. malacea*, 3.vii.1997, *MZ 97267* (LE 233715). **NENETZ REGION:** Bol'shezemel'skaya Tundra, Khar'yaga oil field, 67°11'N, 56°30'E, alt. 70 m, *Betula nana* tundra, on *P. malacea*, 22.vii.2007, *MZ 0731* (LE 210447) [previously published as *Niesslia peltigericola* (Zhurbenko 2008)]. **KRASNOYARSK TERRITORY:** midddle Enisey River, N of Porozhinskaya, 57°30'N, 93°15'E, *Pinus-Betula* forest, on *P. polydactylon*, 20.vi.1995, *V. Kuvaev* (LE 233835). **ALTAI MTS.:** Kosh-Agach Region, Ukok Tableland, junction of Sadakbai and Dzhumaly Rivers, 49°32'N, 87°58'E, alt. 2500 m, in *Larix sibirica* forest, on *P. malacea*, 22.vii.1999, *E. Davydov 2331* (LE 233815) [previously published as cf. *Niesslia peltigericola* (Zhurbenko & Davydov 2000)].

132. *Unguiculariopsis refractiva* (Coppins) Coppins

Notes. – Ascomata are characteristically dark purple. Pathogenicity not observed. New to North America.

Specimen Examined. – **CANADA. NUNAVUT:** Ellef Ringnes Is., Isachsen Bay, 78°47'N, 103°32'W, alt. 40 m, sparse frost boil vegetation, on *Bilimbia lobulata* (th.), 23.vii.2005, *N. Matveeva* (LE 260134).

133. *Unguiculariopsis thallophila* (P. Karst.) W.Y. Zhuang

Notes. – Pathogenicity not observed. New to Russia, Asia and the Arctic. The species was formerly known only on *Lecanora* spp., growing on bark and lignum. *Lecanora hagenii* is a new host species.

Specimen Examined. – **RUSSIA. CHUKOTKA:** Gil'mymlineiveem River, 65°48'N, 173°15'E, stony tundra, on *Lecanora hagenii* var. *fallax* (th.), growing on dead bryophytes, 24.vii.1977, *I. Makarova* (LE 261737).

134. *Vouauxiomyces santessonii* D. Hawksw.

Note. – New to Russia.

Specimen Examined. – **RUSSIA. PSKOV REGION:** 45 km ENE of Gdov, near Lotokhovo, 58°51'N, 28°40'E, alt. 70 m, on *Platismatia glauca* growing on *Picea*, 7 XI 1996, *MZ 9641* (LE 233814).

135. *Vouauxiomyces truncatus* (de Lesd.) Dyko & D. Hawksw.

Specimen Examined. – **UKRAINE. L'VOV REGION:** Truskavets, 49°16'N, 23°30'E, on mossy base of *Betula*, on *Flavoparmelia caperata* (th.), 15.vii.1995, *V. Golubkov* (LE 260266).

136. *Weddellomyces protearius* Nav.-Ros. & Cl. Roux

Notes. – Ascospores pale to medium olive-brown, (1–)3-septate, smooth, (25–)26.5–30 × 11–12 µm, l/b = 2.3–2.6(–2.7) (n = 20). The species has been described from *Caloplaca proteus*, but has also been reported with some uncertainty from *Xanthoria elegans* (Calatayud & Navarro-Rosinés 1998). In the former the ascospores were somewhat larger, which evidently indicates considerable variation of their size in the species. Pathogenicity not observed. New to Russia, Asia and the Arctic.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 250 m, carbonate outcrops in tundra, on *Xanthoria elegans* (th.), 20.viii.1995, *MZ 95526* (LE 261518).

137. *Xenonectriella lutescens* (Arnold) Weese

Notes. – The species has been recently treated in detail and illustrated by Zhurbenko (2009b). Probably commensalistic as normal ascospores were observed in host's hymenium adjacent to *Xenonectriella* perithecia. New to the Arctic. *Fuscopannaria* is a new host genus and *Solorina spongiosa* a new host species.

Specimens Examined. – **CANADA. NUNAVUT:** Ellef Ringnes Is., Isachsen Bay, 78°48'N, 103°36'W, alt. 25 m, sparse frost boil vegetation, on *Fuscopannaria praetermissa* (th.), 28.vii.2005, *N. Matveeva* (LE 260045). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 500 m, wet scree tundra, on *Solorina bispora* var. *subspongiosa* (ap.: hymenium), 20.viii.1995, *MZ 95501:a* (LE 260299:a). **YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 50 m, stony tundra, on *S. saccata* (th., ap.: hymenium), 12.viii.1998, *MZ 98376* (LE 260210); same delta,

Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, dwarf shrub tundra, on *S. saccata* (th., ap.: hymenium), 12.vii.1988, *I. Makarova* (LE 260290); on *S. spongiosa* (th., ap.: hymenium), 21.vii.1998, *MZ 98373* (LE 260189); Verkhoyanskie Mts., headwaters of Tompo River, ca. 64°00'N, 136°00'E, on *S. bispora*, 23.viii.1956, *V. Ivanova* (LE 260129).

138. *Xenonectriella ornamentata* (D. Hawksw.) Rossman
(syn. *Pronectria ornamentata* (D. Hawksw.) Lowen)

Notes. – Ascospores (0–)1-septate, usually slightly constricted at the septum, cells more or less equal, often with big lipid drops, hyaline then pale yellowish brown, tuberculate, (14–)18.5–25.5(–30) × (6–)7.5–10.5(–13) µm, l/b = (1.4–)2.0–3.0(–5.0) (n = 71), 4(–8) per ascus. Conidia hyaline, bacilliform, ca. 4 × 1 µm. Sometimes causes bleaching of host tissues. New to Asia and Asian Russia, also to Murmansk Region and the Russian Arctic. *Peltigera rufescens* is a new host species.

Specimens Examined. All specimens on old and healthy-looking lobes, also on soralia, of *Peltigera* spp. – **RUSSIA. MURMANSK REGION:** Kandalakshskii Gulf of White Sea, Cape Turii, 66°32'N, 34°30'E, coastal rocks, on *P. rufescens*, 29.vii.1967, *A. Dombrovskaya* (LE 233548). **NENETZ REGION:** Bol'shezemel'skaya Tundra, headwaters of Severnaya River, 67°38'N, 54°01'E, *Salix* tundra, on *P. didactyla*, 14.viii.1996, *O. Lavrinenko* (LE 233568). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200 m, rocks in tundra, on *P. rufescens*, 22.vii.1995, *MZ 95423* (LE 233488); W of Levinson-Lessinga Lake, 74°30'N, 98°30'E, alt. 120 m, rocks in tundra, *P. extenuata*, 27.viii.1995, *MZ 95451* (LE 233846); Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, on *P. rufescens*, 4.ix.1995, *MZ 95448* (LE 233817). **CHUKOTKA:** E coast of Kolyuchin Inlet, Yuniveem River basin, 66°40'N, 173°54'W, tundra, on *P. extenuata*, 4.viii.1980, *A. Katenin* (LE 233927); Sireniki, 64°24'N, 173°54'W, moss tundra on coastal cliff, on *P. extenuata*, 17.vii.1986, *A. Katenin* (LE 233957).

139. *Zwackhiomyces coepulonus* (Norman) Grube & R. Sant.

Notes. – Ascospores hyaline, verruculose, 1-septate, often constricted at the septum, (15–)18.5–23(–25) × (5.5–)6–7(–8) µm, l/b = (2.1–)2.6–3.6(–4.4) (n = 42), (3–)8 per ascus. Grube & Hafellner (1990) reported ascospores of the species somewhat shorter: (15–)16–20(–21) × 5.5–8.5(–9) µm, l/b = 2.6. Sometimes infected host lobes slightly bleached. The species has recently been first reported for the Arctic from Greenland (Alstrup et al. 2009). New to Russia and the Russian Arctic.

Specimens Examined. Both specimens on lobes and ap. of *Xanthoria elegans*. – **RUSSIA. NENETZ REGION:** Bol'shoi Tsinkovyi Is. just NW of Vaigach Is., 70°27'N, 58°40'E, 1997, *V. Shevchenko* (LE 261748:a). **TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 50 m, pebbly tundra, 31.vii.1995, *MZ 95532:a* (LE 261598:a).

140. *Zwackhiomyces immersae* (Arnold) Grube & Triebel

Notes. – Perithecia 100–125 µm diam. Asci cylindrical, with short foot, (65–)66–82(–90) × (11–)12–14(–16) µm (n = 10), 8-spored. Ascospores hyaline, verruculose, 1-septate, usually markedly constricted at the septum, (13–)15–18(–19) × (5–)5.5–6.5(–7) µm, l/b = (2.2–)2.4–3.0(–3.6) (n = 47). Pathogenicity not observed. New to Russia, Asia and the Arctic.

Specimen Examined. – **RUSSIA. YAMAL-NENETZ REGION:** Belyi Is., near polar station, 73°18'N, 70°08'E, frost boil dwarf shrub tundra, on cf. *Bacidia bagliettona* [only sterile grey-green crustose verruculose thallus present] over mosses, 27.vii.2009, *D. Walker* (LE 261548).

141. *Zwackhiomyces physciicola* Alstrup

Notes. – Asci subcylindrical, with long foot, 52–80 × 10–15 µm, 8-spored. Ascospores hyaline, narrowly oblong, 1-septate, not constricted at the septum, with slightly wider upper cell, smooth-walled, halo not seen, (15–)16–19(–20) × 4–5 µm, l/b = (3.2–)3.5–4.3(–5.0) (n = 30, in phloxin). Pathogenicity not observed. New to Russia, Asia and the Arctic.

Specimens Examined. Both specimens on healthy-looking and old lobes of *Physcia caesia*. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Shel'pino Bay, 69°05'N, 36°12'E, alt. 10 m, coastal cliffs among tundra, 4.ix.1997, *MZ 97359* (LE 233559). **CHUKOTKA:** Iskaten' Range, 66°35'N, 179°10'W, boulders in tundra, 5.vii.1971, *I. Makarova* (LE 233469).

II – Lichenicolous Lichens

Occasionally lichenicolous lichens are denoted by (*)

1. *Buellia lecanoricola* Renob. nom. provis. *in* Guineana, 2: 59. 1996.

Notes. – Distinct thallus not observed. Ascomata black, plane and marginate to convex and immarginate, 0.1–0.35 mm diam., sessile. Epithecium and hypothecium reddish-brown. Ascospores olive to olive-brown, verruculose, 1-septate, not constricted at the septum, straight to sometimes bent, (11–)12.5–15(–17) × 6.5–7.5(–8) µm, l/b = (1.6–)1.8–2.2(–2.4) (n = 30). Pathogenicity not observed. New to Russia and Asia. *Lecanora hagenii* is a new host species.

Specimen Examined. – **RUSSIA. CHUKOTKA:** Lavrentiya Bay, 65°35'N, 171°00'W, dwarf shrub tundra, on *Lecanora hagenii* (th.) growing on bone, 22.viii.1975, *I. Makarova* (LE 261705).

2. *Caloplaca epithallina* Lynge

Notes. – Formerly known in the Russian Arctic only from Taimyr Pen. (Zhurbenko 1996), based on material documented below. New to Chukotka and the American Arctic.

Specimens Examined. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°39'W, alt. 850 m, upper portion of a small mountain slope with rocks amongst dwarf shrub tundra, on *Rhizoplaca chrysoleuca* (damaged thallus portions) above rock, 1.viii.2001, *MZ 01317* (hb. MZ). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°19'E, alt. 150 m, rocks at the river valley slope, on *R. melanophthalma* (th.), 12.viii.1994, *MZ 94307* (M). **CHUKOTKA:** Iskaten' Range, 66°35'N, 179°10'W, stony mountain slope, on *R. melanophthalma* (th.), 20.vii.1971, *I. Makarova* (M).

3. *Caloplaca psoricida* E.S. Hansen, Poelt & Søchting

Notes. – A rarely reported Arctic species, perhaps conspecific with *Caloplaca ammiospila* (Zhurbenko 2009a). New to Franz Josef Land.

Specimens Examined. All specimens on healthy-looking or decaying squamules of *Psora rubiformis*. – **RUSSIA. FRANZ JOSEF LAND:** Hooker Is., Cape Sedova, 80°20'N, 52°52'E, arctic desert, 27.vii.1930, *V. Savicz*. **SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°03'N, 102°42'E, alt. 60 m, arctic desert, in semi-dried bed of a stream, 16.vii.1996, *MZ 96696*. **TAIMYR PEN.:** lower Pravaya Uboinaya River, "217" Mt., 73°26'N, 82°43'E, alt. 150 m, rocks among dwarf shrub tundra, 5.viii.1990, *MZ 90561:b* (LE 260173:b).

4. *Diplotomma nivale* (Bagl. & Carestia) Hafellner

Notes. – Infected host lobes become white grey. New to Nenetz Region, first verified report for Chukotka.

Specimens Examined. – **RUSSIA. NENETZ REGION:** Bol'shoi Tsinkovyi Is. just NW of Vaigach Is., 70°27'N, 58°40'E, on *Xanthoria elegans* (th., ap.), 1997, *V. Shevchenko* (LE 261748:b, LE 261658:b); Vaigach Is., Dolgaya Bay, 70°16'N, 58°40'E, on *X. elegans* (th.), 1997, *V. Shevchenko* (LE 261688). **TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°28'E, alt. 160 m, rocks in tundra, on *X. elegans* s. l. (th.), 12.viii.1995, *MZ 95545:b* (LE 261558:b); same mts., Zamknutaya River, 74°37'N, 98°33'E, alt. 150 m, rocks in tundra, on *X. elegans* s. l. (th.), 6.viii.1995, *MZ 95522* (LE 261718); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 200–250 m, rocks in tundra, on *X. elegans* s. l. (th.), 22.vii.1995, *MZ 95538* (LE 261618); 25.vii.1995, *MZ 95525* (LE 261588); 20.viii.1995, *MZ 95527:b* (LE 261578:b); on *Caloplaca saxicola* (th., ap.), 20.viii.1995, *MZ 95529:b* (LE 261778:b); same mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 200–250 m, rocks in tundra, on *X. elegans* s. l. (th.), 15.viii.1995, *MZ 95541:a* (LE 261777:a); 17.viii.1995, *MZ 95542* (LE 261767). **CHUKOTKA:** Enmyvaam River, 68°15'N, 166°03'E, stony tundra, on *X. elegans* s. l. (th.) and adjacent rock, 3.vii.1980, *I. Makarova* (LE 261768).

5. *Epilichen glauconigellus* (Nyl.) Hafellner

Notes. – Optionally weakly lichenized. Causes local bleaching. New to North America, the first documented records for Taimyr Pen.

Specimens Examined. – **U.S.A. ALASKA:** Seward Peninsula, 10 km ESE of Nome, 64°29'N, 165°13'W, alt. 25 m, roadside in dwarf shrub tundra, on *Baeomyces rufus* (th.), 1.ix.2001, *MZ 01639* (LE 260145). **RUSSIA. TAIMYR PEN.:** Uboinaya River mouth, 73°36'N, 82°22'E, alt. 20 m, spotty dwarf shrub tundra, on *B. rufus* (th.), 2.viii.1990, *MZ 90730* (LE 260205); lower Pravaya Uboinaya River, "217" Mt., 73°26'N, 82°43'E, alt. 150 m, spotty dwarf shrub tundra, on *B. rufus* (th.), 5.viii.1990, *MZ 90731* (LE 207634); Byrranga Mts., Bikada River, ca. 74°50'N, 106°45'E, alt. 600 m, spotty tundra, on *B. rufus* (th.), 1998, *E. Pospelova* (LE 260087:a).

6. *Epilichen scabrosus* (Ach.) Clem.

Specimens Examined. – **U.S.A. ALASKA:** Seward Peninsula, 10 km ESE of Nome, 64°29'N, 165°13'W, alt. 25 m, roadside in dwarf shrub tundra, on *Baeomyces rufus* (th.), 1.ix.2001, *MZ 0140* (LE 260295). **RUSSIA. TAIMYR PEN.:** Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30 m, dwarf shrub tundra, on *B. rufus* (th.), 5.vii.1990, *MZ 90740* (LE 260105); 14.vii.1990, *MZ 90738* (LE 260185); on *B. placophyllus* (th.), 14.vii.1990, *MZ 90737* (LE 260085); Uboinaya River mouth, 73°36'N, 82°22'E, alt. 15 m, spotty dwarf shrub tundra, on *B. rufus* (th.), 10.viii.1990, *MZ 90736* (LE 260075).

7. **Lecanora leptacinella* Nyl.

Notes. – New to Polar Ural, Yamal-Gydan Region, and Putorana Plateau.

Specimens Examined. All specimens on moribund bryophytes and vascular plant remnants, occasionally on peat or decaying lichens. – **U.S.A. ALASKA:** North Slope, Sagwon, 69°26'N, 148°40'W, alt. 275 m, frost boil tundra, 5.viii.2003, *D. Walker*. **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°50'N, 65°35'E, alt. 450 m, mountain tundra, 26.vi.1993, *MZ 9328*. **YAMAL PEN.:** Neromayakha River, 70°10'N, 69°10'E, tundra, on *Cladonia coccifera* (decayed podetium), 12.viii.1990, *O. Khitun* (LE 261557). **SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., W coast of Akhmatova Bay, 79°02'N, 102°42'E, alt. 60 m, 16.vii.1996, *MZ 96516*; same is., Cape Antseva, 78°13'N, 103°15'E, alt. 30 m, 23.viii.1998, *N. Matveeva* (M). **TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°20'N, 98°05'E, alt. 400 m, *Dryas* stony tundra, on *Sphaerophorus globosus* (decayed branch), 10.vii.1991, *V. Kuvaev* (LE 261667); NW coast of Pyasino Lake, N'yapan hills, 70°05'N, 87°43'E, alt. 100 m, *Betula nana-Ledum*-lichen-moss tundra, 7.viii.1999, *L. Zanokha* (M). **PUTORANA PLATEAU:** Kapchuk Lake, 69°29'N, 91°00'E, alt. 1000 m, mountain tundra, 3.viii.1983, *MZ 83198*. **WRANGEL' IS.:** Gusinaya River, 71°07'N, 179°21'E, alt. 180 m, spotty *Dryas* tundra, 19.viii.1991, *S. Kholod* (H); Krasnyi Flag River, 71°31'N, 178°53'W, alt. 15 m, moss tundra, 29.viii. 1997, *S. Kholod* (H); Naskhok River, 71°23'N, 178°06'W, alt. 14 m, lichen-*Luzula confusa* tundra, 25.viii.1998, *S. Kholod* (M); same River, 71°25'N, 178°20'W, alt. 12 m, lichen-graminoid tundra, on decaying *Cladonia* and bryophytes, 29.viii.1998, *S. Kholod* (M).

8. **Protothelenella sphinctrinoides* (Nyl.) H. Mayrhofer & Poelt

Notes. – This mainly terricolous species also occurs on the thalli of other lichens. This is the first report on *Fuscopannaria*. Distinct independent thallus not observed.

Specimen Examined. – **RUSSIA. CHUKOTKA:** E coast of Kolyuchin Inlet, Yuniveem River basin, 66°40'N, 173°54'W, dwarf shrub-lichen-moss tundra, on *Fuscopannaria viridescens* (bleached thallus portions), 27.viii.1980, *A. Katenin* (LE 260171).

9. *Rimularia insularis* (Nyl.) Rambold & Hertel

Notes. – Produces patches within *Lecanora* thalli. New to the Russian Arctic and the Urals Mts. (Andreev 2008b).

Specimens Examined. All specimens on *Lecanora rupicola* (th.). – **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°57'N, 65°39'E, alt. 150 m, rocks in sparse *Larix* forest, 27.vi.1993, *MZ 9394* (LE 261595). **YAKUTIYA:** Laptevykh Sea coast, 5 km S of Tiksi, 71°36'N, 128°58'E, alt. 20 m, shale outcrops in tundra, 19.vii.1998, *MZ 98400:b* (LE 261604:b). **CHUKOTKA:** Iskaten' Range, 66°35'N, 179°10'W, boulders in tundra, 1.vii.1971, *I. Makarova* (LE 261553). Inchoun, 66°15'N, 170°20'W, stony tundra, 29.vii.1975, *I. Makarova* (LE 261615).

10. *Scutula dedicata* Triebel, Wedin & Rambold

Notes. – On upper and occasionally lower sides of old *Peltigera* lobes. *Peltigera lepidophora* is a new host species. New to Russia, Asia and Arctic (Triebel et al. 1997).

Specimens Examined. – **RUSSIA. YAKUTIYA:** junction of Indigirka and In'yali Rivers, 65°10'N, 143°10'E, alt. 500 m, sparse *Larix* forest, on *Peltigera rufescens*, 23.vi.1976, *I. Makarova* (LE 260180) [*Karsteniomyces* state only]; 28.vi.1976, *I. Makarova* (LE 233977) [*Karsteniomyces* state only; rev. D. Triebel, 1997]. **CHUKOTKA:** Baran'e Lake, 66°54'N, 175°15'E, stony tundra, on *P. lepidophora*, 22.vii.1980, *I. Makarova* (LE 233997) [*Libertiella* state only].

11. *Thelocarpon epibolum* Nyl. f. *longisporum* H. Magn. nom. inval.

Notes. – This insufficiently known taxon is discussed by Kocourková (2000). On old decaying lobes of *Peltigera*. New to Yamal-Gydan Region and Arctic Yakutiya.

Specimens Examined. – **RUSSIA. MURMANSK REGION:** Kol'skii Gulf, Vaenga River mouth, 69°04'N, 33°29'E, rocky *Betula* forest, on *P. aphthosa*, 24.viii.1971, *A. Dombrovskaya* (LE 233756); Shukozero Lake E of Severomorsk, 69°04'N, 33°34'E, alt. 60 m, *Betula* forest, on *P. aphthosa*, 25.viii.1971, *A. Dombrovskaya* (LE 233826); Tumannyi, 69°00'N, 35°48'E, alt. 220 m, lichen-dwarf shrub tundra, on *P. aphthosa*, 11.viii.1977, *A. Dombrovskaya* (LE 233766); Tuloma River, Padun, 68°35'N, 31°50'E, *Pinus* forest, on *P. aphthosa*, 30.viii.1971, *A. Dombrovskaya* (LE 233895:a); Alakurtti, Tumcha River, 66°57'N, 30°24'E, alt. 260 m, stony mixed forest, on *P. aphthosa*, 1.viii.1971, *A. Dombrovskaya* (LE 233816); Khibiny Mts., Vud'yavrchorr Mt., 67°39'N, 33°38'E, alt. 500 m, *Betula* krummholz, on *P. aphthosa*, 4.viii.1969, *A. Dombrovskaya* (LE 233995:b); Iokan'ga River, Sukhoe Lake, 67°55'N, 39°56'E, *Betula* krummholz, on *P. aphthosa*, 28.vii.1949, P. Medvedev (LE 233836); Ponoi, 67°04'N, 41°06'E, rocks by the river, on *P. aphthosa*, 22.ix.1968, *A. Dombrovskaya* (LE 233996). **GYDAN PEN.:** Eniseyskii Gulf coast, Leskino, 72°20'N, 79°30'E, tundra, on *P. leucophlebia*, 15.viii.1972, *R. Yunak & G. Prokop'eva* (LE 233716:a) [identification uncertain, since ascospores are rather short: 4.5–5 × 2–2.5 µm]. **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300 m, stony tundra, on *P. leucophlebia*, 30.viii.1995, *MZ 95464:b* (LE 233894:b); S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 120 m, rocks in tundra, on *P. leucophlebia*, 28.viii.1995, *MZ 95454* (LE 233926); Khatanga, 71°58'N, 102°27'E, sparse *Larix* forest, on *P. leucophlebia*, 4.ix.1995, *MZ 95439:c* (LE 233928:c). **IRKUTSK REGION:** Nizhne-Ilimskii District, top of Rudnaya Mt., *Pinus* forest, on *P. leucophlebia*, 22.vii.1961, *Karpenko* (LE 233946:a). **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Matvei Aryyta Is., 72°30'N, 126°25'E, alt. 7 m, on sand, on *P. leucophlebia*, 30.vii.1998, *MZ 98335* (LE 233806); same delta, Kurungnaakh-Sise Is., 72°20'N, 126°18'E, alt. 40 m, lichen-moss tundra, on *P. leucophlebia*, 8.viii.1998, *MZ 98336:a* (LE 233956:a); *MZ* 98354 (LE 233844).

12. *Thelocarpon impressellum* Nyl.

Notes. – Ascospores elliptic to broadly elliptic, (6–)7.5–10 × (4–)5–6 µm, l/b = (1.3–)1.4–1.8(–2) (n = 20), without pseudosepta. New to Taimyr Pen. *Solorina* is a new host genus.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 50 m, tundra, on *Solorina bispora* (decaying lobes), 25.viii.1995, *MZ 95477:b* (LE 233863:b).

III – Non-lichenicolous Lichens

1. *Acarospora putoranica* N.S. Golubk. & Zhurb.

Notes. – The species is known in the Arctic only from Taimyr Pen. (Zhurbenko 1996), based on unpublished records documented below. It was described from neighbouring Subarctic Putorana Plateau and additionally found in Northern Ural (Golubkova & Zhurbenko 1990, Zhurbenko 2004).

Specimens Examined. All specimens on soil in non-carbonate rock fissures among tundra. – **RUSSIA**. **TAIMYR PEN.:** Byrranga Mts., Zamknutaya River, 74°37'N, 98°33'E, alt. 150 m, 6.viii.1995, *MZ 95515* (filed under *Adelococcus alpestris*, LE 260024); same mts., N of Levinson-Lessinga Lake, 74°32'N, 98°34'E, alt. 200 m, 29.vii.1994, *MZ 94141* (UPS); 26.vii.1995, *MZ 9553* (M); W of Levinson-Lessinga Lake, 74°30'N, 98°30'E, alt. 120 m, 27.viii.1995, *MZ 9538* (F); same mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 200 m, 15.viii.1995, *MZ 95168* (hb. MZ), *MZ 95169* (hb. MZ).

2. *Agonimia tristicula* (Nyl.) Zahlbr.

Notes. – The species represents a southern element in the Arctic flora and is new to Polar Ural, Chukotka and Arctic Alaska. Formerly known in Alaska only from Prince of Wales Is. (Zhurbenko et al. 2005).

Specimens Examined. All specimens on soil, bryophytes or plant remnants. – **U.S.A. ALASKA:** Noatak National Preserve, 68°16'N, 161°50'W, alt. 530 m, alpine *Dryas* shrub tundra, 26.vii.2005, *J. Roth* (M). **NORWAY. SVALBARD:** North-East Land, Murchison fjord, Nord Bay, 80°03'N, 18°56'E, alt. 12 m, arctic desert, 19.viii.2007, *N. Matveeva* (BG). **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°56'N, 65°35'E, alt. 600 m, rock outcrops among mountain tundra, 26.vi.1993, *MZ 9365*. **PUTORANA PLATEAU:** Kapchuk Lake, 69°29'N, 91°00'E, alt. 1000 m, top of the plateau, wet mountain tundra, 3.viii. 1983, *MZ 83148* (hb. MZ), *MZ 83149* (M); SE of Ayan Lake, 69°00'N, 94°15'E, alt. 600 m, stones in sparse *Larix* forest, 13.viii. 1984, *MZ 84205* (hb. MZ). **WRANGEL' IS.:** headwaters of Neizvestnaya River, 71°12'N, 179°17'W , alt. 150 m, *Dryas* tundra over carbonates, 15.vii.1987, *S. Kholod* (H); sparse *Saxifraga oppositifolia–Oxytropis gorodkovii* tundra over carbonates, 12.viii. 1987, *S. Kholod* (H). **CHUKOTKA:** Sireniki, 64°24'N, 173°54'W, tundra, 22.vii.1983, *I. Makarova* (hb. MZ).

3. *Anamylopsora pulcherrima* (Vain.) Timdal

Notes. – For a long time was regarded as an Asian species of mainly arid regions, until it was reported by Timdal (1991) from a few localities in Alaska, including one from its North Slope. Known in the Arctic only from this region.

Specimens Examined. Both specimens on carbonate and non-carbonate rocks on mountain slope amongst moss-lichen-dwarf shrub tundra, in rock crevices, partly on soil deposits. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°39'W, alt. 850 m, 1.viii.2001, *MZ 01311* (hb. MZ); same Slope, Brooks Range, Atigun Canyon by the Dalton Highway, 68°27'N, 149°21'W, alt. 800 m, 31.vii.2001, *MZ 01629* (ALA).

4. *Anaptychia bryorum* Poelt

Notes. – Lobes of this species often have a characteristic form resembling a long "foot" with 3–10 narrow, separated "toes". This rarely reported Arctic species is first documented for Putorana Plateau, where it was formerly erroneously reported as *Phaeophyscia constipata* (Norrl. & Nyl.) Moberg (Zhurbenko 2000). New to Western Sayan Mts. and a number of Taimyr localities. Formerly known from Northern Alaska only from Barrow (Fryday 2004).

Specimens Examined. All specimens on soil on/among bryophytes, often moribund. Partly originally misidentified and depositied as *Phaeophyscia constipata*. – **U.S.A. ALASKA:** North Slope, Barter Is. near Kaktovik, dry *Dryas*-lichen tundra, 70°08'N, 143°37'W, 8.viii.1994, 10.viii.1994, *D. Walker* (hb. MZ); same Slope, Toolik Lake, 68°37'N, 149°36–39'W, alt. 800 m, spotty moss-lichen-dwarf shrub tundra, 28.vii.2001, *MZ 01474* (hb. MZ), *MZ 01576* (hb. MZ); same slope, Brooks Range, upper stream of Atigun River, 68°07'N, 149°28'W, alt. 1400 m, dry moss-lichen-dwarf-shrub tundra, 31 July 2001, *MZ 01363* (ALA). **RUSSIA. SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, slope of coastal terrace, 13.vii.1996, *MZ 96302* (H, KPABG, LE-Lichens, M, UPS); 14.vii.1996, *MZ 96305* (hb. MZ); same is., W coast of Akhmatova Bay, 79°04'N, 102°41'E, alt. 40 m, 18.vii.1996, *MZ 96298* (hb. MZ). **TAIMYR PEN.:** Uboinaya River mouth, 73°36'N, 82°22'E, alt. 10 m, spotty dwarf shrub tundra, 11.viii.1990, *MZ 90504* (hb. MZ); Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 20–30 m, rocks in dwarf shrub tundra, 3.vii.1990, *MZ 901152* (hb. MZ); pebbly *Dryas* tundra, 12.vii.1990, *MZ 90867* (hb. MZ); Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 200 m, rocks in tundra, 15.vii.1995, *MZ 901153* (hb. MZ); 74°20'N, 98°05'E, alt. 410 m, *Novosiversia* stony tundra, 16.vii. 1991, *V. Kuvaev*; same mts., S of Levinson-Lessinga Lake, 74°26'N, 98°55'E, alt. 250 m, stony tundra, 28.vii.1995, *MZ 9547* (KPABG, M). **PUTORANA PLATEAU:** SE of Ayan Lake, 69°00'N, 94°15'E, alt. 850 m, subalpine belt, 29.viii.1984, *MZ s.n.* (LE-Lichens). **SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59' N, 95°28' E, alt. 1500 m, above boulder in sparse *Pinus sibirica-Abies sibirica* forest, 15.vii.2009, *MZ 092*.

5. *Arctoparmelia subcentrifuga* (Oxner) Hale

Note. – The species is presently known only from scattered finds in Northern hemisphere (Vitikainen & Dudoreva 2003).

Specimen Examined. – **RUSSIA. PUTORANA PLATEAU:** Kapchuk Lake, 69°29'N, 91°00'E, alt. 1000 m, over boulder in mountain tundra, on soil, 15.viii.1983, *MZ 83175* (M); E of Lama Lake, 69°23'N, 91°39'E, alt. 100–300 m, *Larix* forest, on naked lignum, 14.vii.1984, *MZ 84127* (hb. MZ) [rev. J. Poelt, 1994]; on lichen and moss remnants over boulder, 16.vii.1984, *MZ 84128*; NW of Ayan Lake, 69°18'N, 93°35'E, alt. 700 m, sparse *Larix* forest, on naked lignum, 2.viii.1984, *MZ 84129* (hb. MZ) [rev. J. Poelt, 1994].

6. *Arctopeltis thuleana* Poelt

NOTE. – A rather rarely reported circumpolar species distributed in coastal Arctic region (Poelt 1983, Zhurbenko & Hansen 1993).

SPECIMENS EXAMINED. – **RUSSIA. FRANZ JOSEF LAND** (arctic desert)**:** Hooker Is., 80°20'N, 52°52'E, on Rubini Rock, 23.vii.1930, *V. Savicz* (LE-Lichens); Northbrook Is., Cape Flora, 80°11'N, 50°14'E, on rocks below bird colony, 28.vii. 1930, *V. Savicz* (hb. MZ).

7. *Arthonia glebosa* Tuck.

(syn. *Toninia groenlandica* Lynge emend. Bredkina)

NOTES. – The species is presently known in Russia from only Putorana Plateau, Baikal Siberia, and boreal Yakutiya (Makryi 2008, Zhurbenko 1992, 2003). New to the American Arctic.

SPECIMENS EXAMINED. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°39'W, alt. 850 m, on rocks on mountain slope amongst moss-lichen-dwarf shrub tundra, on sandy soil with moss remnants, 1.viii.2001, *MZ 01628* (ALA). **RUSSIA. BAIKAL SIBERIA:** Irkutsk Region, S coast of Ol'khon Is., 6 km W of Cape Ukhan, 53°04'N, 107°19'E, alt. 500 m, open coastal cliffs, on sandy soil with detritus, 6.vi.2005, *MZ 05153* (M).

8. *Asahinea scholanderi* (Llano) C.F. Culb. & W.L. Culb.

NOTE. – This conspicuous and hardly overlooked species is a good representative of the non-circumpolar element in the Arctic, where it ranges eastwards from Taimyr Pen. to the West Hudsonian Region.

SPECIMENS EXAMINED. – **RUSSIA. TAIMYR PEN.:** lower Pravaya Uboinaya River, "217" Mt., 73°26' N, 82°43' E, alt. 150 m, above boulder on mountain slope in dwarf shrub tundra, 5.viii.1990, *MZ 90747* (hb. MZ); Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°40'E, alt. 200 m, on rocks among tundra, 17.viii.1995, *MZ 9558* (M); same mts., W of Levinson-Lessinga Lake, 74°30'N, 98°30'E, alt. 120 m, on rocks among tundra, 27.viii.1995, *MZ 9578* (M).

9. *Aspicilia transbaicalica* Oxner

NOTES. – This Eurasian species is most common in Southern Siberia and Mongolia. Formerly its northernmost finds were on Putorana Plateau, adjacent to Taimyr Pen. (Zhurbenko 2000). New to the Arctic.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°19'E, alt. 150 m, on S-exposed rocks among tundra at the river valley slope, 12.viii.1994, *MZ 94511* (hb. MZ).

10. *Aspilidea myrinii* (Fr.) Hafellner

NOTE. – The species is known in the Russian Arctic only from Kola Pen. and Polar Ural (Zhurbenko 2002).

SPECIMEN EXAMINED. – **RUSSIA. POLAR URAL:** Sob' River, 66°59'N, 65°45'E, alt. 300 m, on boulder in subalpine belt, 17.vii.1986, *MZ 86130* (filed under *Sagediopsis aspiciliae*, LE 261515).

11. *Biatora cuprea* (Sommerf.) Fr.

NOTE. – This species has been scarcely documented in the Russian Arctic.

SPECIMENS EXAMINED. All specimens on dead mosses. – **RUSSIA. SEVERNAYA ZEMLYA:** W coast of Akhmatova Bay, 79°04'N, 102°41'E, alt. 40 m, arctic desert, 18.vii.1996, *MZ 96669* (FR), *96941*. **CHUKOTKA:** Televeem River, 65°50'N, 175°05'E, *Cassiope*-forb tundra, 22.vii.1979, *I. Makarova* (FR) [det. C. Printzen, 2003]; Ioni Lake, 65°53'N, 173°44'W, 3.vii. 1977, *I. Makarova* (hb. MZ).

12. *Biatora subduplex* (Nyl.) Printzen

NOTE. – The species is common in the Arctic, but still new to Polar Ural.

SPECIMEN EXAMINED. – **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°56'N, 65°35'E, alt. 600 m, mountain tundra, on soil, 26.vi.1993, *MZ 9354* (hb. MZ).

13. *Biatorella contigua* N.S. Golubk. & Piin

NOTES. – The species is known from a few locations in Arctic Siberia and Alaska (Zhurbenko et al. 2005). The first documented location from Yakutiya.

SPECIMENS EXAMINED. – **RUSSIA. TAIMYR PEN.:** Uboinaya River mouth, 73°36'N, 82°22'E, alt. 10 m, frost boil dwarf shrub-moss-lichen tundra, on spots of loam with pebble, 9.viii.1990, *MZ 90356* (GZU, UPS). **YAKUTIYA:** lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, on sandy soil, 4.viii.1998, *MZ 98314* (hb. MZ).

14. *Brigantiaea fuscolutea* (Dicks.) R. Sant.

NOTE. – The species remains scarcely documented in the Russian and American Arctic.

SPECIMENS EXAMINED. – **CANADA. NUNAVUT:** Amund Ringnes Is., 78°25'N 96°45'W, alt. 30 m, arctic desert, on moribund mosses, 2.viii.1999, *N. Matveeva* (M). **RUSSIA. WRANGEL' IS.:** junction of Mamontovaya River and Kamenistyi Creek, 70°59'N, 179°45'E, alt. 100 m, in sedge-moss tundra, on mosses, 1996, *S. Kholod* (hb. MZ).

15. *Bryodina rhypariza* (Nyl.) Hafellner & Türk var. *cyanotropha* Poelt & H. Mayrhofer

NOTE. – This rare variety has been reported new to Russia (Zhurbenko 2000) from Putorana on the basis on the material cited below.

SPECIMEN EXAMINED. – **PUTORANA PLATEAU:** Kapchuk Lake, 69°29'N, 91°00'E, alt. 200 m, above boulder in *Larix* forest, 2.viii.1982, *A. Titov* (M) [associated with *Spilonema revertens*].

16. *Bryodina rhypariza* (Nyl.) Hafellner & Türk var. *rhypariza*

NOTE. – The species has been rarely reported in the Arctic. New to Polar Ural.

SPECIMENS EXAMINED. All specimens on sandy soil, sometimes with mosses. – **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°56'N, 65°35'E, alt. 600 m, rocks in mountain tundra, 26.vi.1993, *MZ 9367* (hb. MZ). **TAIMYR PEN.** (rocks in dwarf shrub tundra)**:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 200 m, 15.viii.1995, *MZ 95559* (hb. MZ); same mts., N of Levinson-Lessinga Lake, 74°32'N, 98°33'E, alt. 300 m, 29.vii.1994, *MZ 94113* (hb. MZ), *MZ 94116:b* (UPS); S of Levinson-Lessinga Lake, 74°24'N, 98°49'E, alt. 150 m, 29.vii.1995, *MZ 95103* (M). **PUTORANA PLATEAU:** SE of Ayan Lake, 69°00'N, 94°15'E, alt. 600 m, rocks in sparse *Larix* forest, 13.viii.1984, *MZ 84131* (hb. MZ) [rev. J. Poelt, 1994]. **CHUKOTKA:** Amguema River at 174 km of the road Egvekinot-Iul'tin, 67°41'N, 178°35'W, scree *Dryas* tundra, 6.viii.1979, *I. Makarova* (hb. MZ).

17. *Caloplaca approximata* (Lynge) H. Magn.

NOTE. – New to Taimyr Pen.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 250 m, on sandstone rocks, 26.viii.1994, *MZ 94477* (hb. MZX) [rev. U. Søchting, 1996].

18. *Caloplaca celata* Th. Fr.

NOTES. – New to Alaska (Thomson 1997). The species was recently reported new to the Russian Arctic based on the finds documented below (Kholod & Zhurbenko 2005).

Specimens Examined. All specimens on plant remnants, mostly on dead *Saxifraga*. – **U.S.A. ALASKA:** North Slope, Franklin Bluffs, 69°40'N, 148°40'W, alt. 125 m, frost boil tundra, 4.viii.2003, *D. Walker* (hb. MZ). **RUSSIA. WRANGEL' IS.:** Neizvestnaya River, 71°14'N, 179°14'W, alt. 140, polygonal *Dryas* tundra over carbonates, 10.viii.1987, *S. Kholod* (H) (hb. MZ); same river, 71°14'N, 178°56'W, alt. 150 m, dry sparse *Carex hepburnii* tundra, 1.viii.1987, *S. Kholod* (H); Krasnyi Flag River, 71°16'N, 178°48'W, alt. 100 m, spotty *Dryas* tundra over carbonates, 18.vii.1997, 7.viii.1997, *S. Kholod* (H).

19. *Caloplaca tominii* Savicz

Note. – New to the Russian Arctic.

Specimens Examined. – **CANADA. BRITISH COLUMBIA:** Kamloops, 50°40'N, 120°09'W, alt. 400 m, dry loess hills with open *Artemisia* heath, on loess, 25.vii.2002, *MZ 02115* (hb. MZ). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, on sandy soil with bryophyte remnants over carbonate rocks, 9.viii.1995, *MZ 95133* (hb. MZ). **YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, on sandy soil over dry S-exposed diabaz rock, 12.viii.1998, *MZ 98165* (M) [with ap.].

20. *Caloplaca xanthostigmoidea* (Räsänen) Zahlbr.

Note. – New to Arctic Yakutiya and Chukotka.

Specimens Examined. All specimens on bryophytes or occasionally on lichen remnants. – **U.S.A. ALASKA:** North Slope, Brooks Range, Atigun Canyon by the Dalton Highway, 68°27'N, 149°21'W, alt. 950 m, carbonate rocks among tundra, 31.vii.2001, *MZ 01316* (hb. MZ). **CANADA. NORTHWEST TERRITORIES:** Prince Patrick Is., 1 km SE of Mould Bay station, 76°14'N, 119°18' W, hummocky dwarf shrub-graminoid-forb-moss-lichen–tundra, 18.vii.2004, 20.vii.2004, *D. Walker* (hb. MZ). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°08'E, alt. 200 m, rocks among tundra, 10.viii.1994, *MZ 94212* (M) [confirm. U. Søchting, 1996]; same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 250 m, sandstone rocks, 26.viii.1994, *MZ 94487*; E of Levinson-Lessinga Lake, 74°29'N, 98°40'E, alt. 180 m, carbonate rocks, 20.viii.1994, *MZ 9446* (hb. MZ). **YAKUTIYA:** lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, 4.viii.1998, *MZ 98223*; Laptevykh Sea coast, 4 km NW of Tiksi, 71°39'N, 128°44'E, alt. 100 m, rocks in tundra, 24.viii.1998, *MZ 98122* (M). **CHUKOTKA:** Baran'e Lake, 66°54'N, 175°15'E, in tundra, 31.vii.1980, *I. Makarova* (M).

21. *Candelaria concolor* (Dicks.) Stein

Note. – Rarely reported in the Arctic.

Specimen Examined. – **RUSSIA. CHUKOTKA:** Gil'mymlineiveem River, 65°48'N, 173°15'E, on mosses in dwarf shrub tundra, 18.vii.1977, *I. Makarova* (hb. MZ).

22. *Cetraria kamczatica* Savicz

Notes. – The find represents a western range extension of this Beringian species. New to Anabar–Olenek Region of the Russian Arctic.

Specimen Examined. – **RUSSIA. YAKUTIYA:** Laptevykh Sea coast, 3 km NW of Tiksi, 71°39'N, 128°45'E, alt. 80 m, dwarf shrub-moss-lichen tundra, in lichen-moss mat, 24.viii.1998, *MZ 98126* (M).

23. *Cetraria odontella* (Ach.) Ach.

Note. – New to Anabar–Olenek Region of the Russian Arctic.

Specimens Examined. Both specimens on soil among mosses. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°25'N, 98°48'E, alt. 50 m, stony tundra, 31.vii.1995, *MZ 95136* (M). **YAKUTIYA:** Laptevykh Sea coast, 3 km SW of Tiksi, 71°40'N, 128°40'E, alt. 50 m, lichen-dwarf shrub tundra, 17.vii.1998, *MZ 98182* (M).

24. *Cetraria rassadinae* Makryi

NOTES. – This probably overlooked species (Plate 3, fig. 6) was described from Baikal Siberia and lateron reported from Altai Mts. and Putorana Plateau (Makryi 1984, Sedel'nikova 1990, Zhurbenko 2000). New to Sayan Mts.

SPECIMENS EXAMINED. – **RUSSIA. PUTORANA PLATEAU:** Kapchuk Lake, 69°29'N, 91°00'E, alt. 200 m, over boulder in *Larix* forest, 13.viii.1983, *MZ 83168* (M); Keta-Irbo River, 68°51'N, 89°44'E, alt. 180 m, base of mountain slope, over boulder in *Larix* forest, 25.vii.2003, *S. Gorozhankina* (M). **SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'–54°00'N, 95°25–29'E, alt. 1400–1550 m, common and abundant over mossy rocks and boulders in subalpine meadows and sparse *Pinus sibirica-Abies sibirica* forest, 5.vii.2009, *MZ 096* (hb. MZ); 6.vii.2009, *MZ 099* (hb. MZ); 14.vii.2009, *MZ 097* (hb. MZ); 19.vii.2009, *MZ 098* (hb. MZ); 20.vii.2009, *MZ 094* (hb. MZ), *MZ 095* (hb. MZ).

25. *Cetrelia alaskana* (C.F. Culb. & W.L. Culb.) C.F. Culb. & W.L. Culb.

NOTE. – A rarely reported Beringian species.

SPECIMENS EXAMINED. All specimens on soil in lichen-moss mat in moss-lichen-dwarf shrub tundras. – **RUSSIA. YAKUTIYA:** Laptevykh Sea coast, 3 km NW of Tiksi, 71°39'N, 128°45'E, alt. 80 m, 24.viii.1998, *MZ 98125* (M); 1 km S of Tiksi, 71°37'N, 128°54'E, alt. 100 m, slope of Lyal'kin Pup Mt., 18.vii.1998, *MZ 98216* (GZU). **CHUKOTKA:** Baran'e Lake, 66°54'N, 175°15'E, 31.vii.1980, *I. Makarova* (M).

26. *Cladonia cornuta* (L.) Hoffm. ssp. *cornuta*

NOTE. – The species is common in the Arctic, but still new to Franz Josef Land.

SPECIMEN EXAMINED. – **RUSSIA. FRANZ JOSEF LAND:** Mac Clintock Is., arctic desert, 80°05'N, 52°54'E, on soil, 30.vii.1930, *V. Savicz* (LE-Lichens).

27. *Cladonia cornuta* (L.) Hoffm. ssp. *groenlandica* (Å.E. Dahl) Ahti

NOTE. – The second record in the Russian Arctic after Taimyr Pen., new to Yamal-Gydan Region (Zhurbenko & Ahti 2005).

SPECIMEN EXAMINED. – **RUSSIA. YAMAL PEN.:** Bovanenkova gas field, Vas'kiny Dachi, 70°18'N, 68°53'E, on soil in dwarf shrub-moss-lichen tundra, 25.viii.2007, *D. Walker* (hb. MZ).

28. *Cladonia decorticata* (Flörke) Spreng.

NOTE. – New to Yamal-Gydan Region.

SPECIMEN EXAMINED. – **RUSSIA. YAMAL PEN.:** Bovanenkova gas field, Vas'kiny Dachi, 70°18'N, 68°53'E, on soil in dwarf shrub-moss-lichen tundra, 25.viii.2007, *D. Walker* (hb. MZ).

29. *Cladonia gracilis* (L.) Willd. subsp. *vulnerata* Ahti

NOTE. – This subspecies is rather rarely recorded in the Arctic (Ahti 1980).

SPECIMENS EXAMINED. Both specimens on soil in tussock tundra. – **U.S.A. ALASKA:** North Slope, Sagwon, 69°26'N, 148°42'W, alt. 300 m, 6.viii.2003, *D. Walker* (hb. MZ); same Slope, Happy Valley, 69°09'N, 148°51'W, alt. 320 m, 8.viii.2003, *D. Walker* (hb. MZ).

30. *Coccocarpia erythroxyli* (Sprengel) Swinscow & Krog

NOTE. – This species represents a southern element in the Arctic flora, where it is known from a few scattered finds in Beringia (Brodo et al. 2001).

Specimens Examined. All specimens on mosses and vascular plant remnants. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°18–39'W, alt. 800 m, spotty moss-lichen-dwarf shrub tundra on stony hills, 26.vii.2001, *MZ 01562* (ALA); 28.vii.2001, *MZ 01482* (hb. MZ), *MZ 01507* (hb. MZ), *MZ 01596* (hb. MZ), *MZ 01503* (BG); 1.viii.2001, *MZ 01354* (BG); same Slope, Brooks Range, upper stream of Atigun River, 68°07'N, 149°28'W, alt. 1400 m, moss-lichen-dwarf shrub tundra on top of a hill, 31.vii.2001, *MZ 01489* (hb. MZ).

31. *Cystocoleus ebeneus* (Dillwyn) Thwaites

Notes. – The species was formerly known in the Russian Arctic from Severnaya Zemlya (Zhurbenko & Matveeva 2006). New to Yamal-Gydan Region.

Specimens Examined. All specimens on soil among bryophytes. – **RUSSIA. YAMAL-NENETZ REGION:** Belyi Is., near polar station, 73°18'N, 70°08'E, polygonal tundra, 27.vii.2009, *D. Walker* (hb. MZ). **SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, on moribund mosses, 13.vii.1996, *MZ 96588* (hb. MZ); same is., Cape Antseva, 78°13'N, 103°15'E, alt. 30 m, 1.viii.1997, *N. Matveeva* (hb. MZ).

32. *Dactylina ramulosa* (Hook. f.) Tuck.

Note. – The species is common in the Arctic, but still new to Franz Josef Land.

Specimen Examined. – **RUSSIA. FRANZ JOSEF LAND:** Hooker Is., 80°20'N, 52°52'E, arctic desert, on soil, 24.vii. 1930, *V. Savicz* (LE-Lichens).

33. *Dermatocarpon miniatum* (L.) W. Mann

Note. – The first documented report for Taimyr Pen.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** S of Levinson-Lessinga Lake, 74°24'N, 98°46'E, alt. 150 m, on carbonate rocks in tundra, 1.viii.1995, *MZ 9564* (M).

34. *Dermatocarpon rivulorum* (Arnold) Dalla Torre & Sarnth.

Note. – New to Arctic Yakutiya.

Specimen Examined. – **RUSSIA. YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Amerika-Khaya hill, 72°35'N, 126°18'E, alt. 50 m, on wet rock in tundra, 30.vii.1998, *MZ 98129* (M).

35. *Euopsis pulvinata* (Schaer.) Vain.

Note. – New to Lapponia Murmanica Province of Murmansk Region (Urbanavichus et al. 2008).

Specimen Examined. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Voron'ya River mouth, 69°09'N, 35°50'E, alt. 20 m, on sand in patches of *Empetrum*-bryophyte-lichen tundra, 30.viii.1997, *MZ 97385* (hb. MZ).

36. *Flavocetraria minuscula* (Elenkin & Savicz) Ahti, Poryadina & Zhurb.

Notes. – This species was suggested to have an amphi-Beringian, mostly boreal, distribution (Zhurbenko et al. 2005), but new finds indicate a wider range, at least in Asia. *Flavocetraria cucullata* var. *rabotnovii* Oxner reported from Vitimskii Reserve (Makryi & Lishtva 2005) most probably refers to the same species. New to Taimyr Pen.

Specimens Examined. – **RUSSIA. TAIMYR PEN.:** Bikada River, ca. 74°50'N, 106°10'E, spotty *Dryas-Carex*-moss tundra on a hill slope, on soil, 9.viii.1978, *M. Sokolova* (hb. MZ). **IRKUTSK REGION:** Stanovoe Upland, Vitimskii Reserve, ca. 57°30'N, 116°30'E, alt. 1200 m, mountain slope with stony lichen tundra, on soil, 16.vii.1987, *V. Vlasenko, S. Ivanova & N. Anisimova* (hb. MZ).

37. *Fuscopannaria viridescens* P.M. Jørg. & Zhurb.

NOTES. – This recently described arctic-alpine species is usually sterile and hence not always recognized. It is mostly known from the Arctic islands and coastal regions (Jørgensen & Zhurbenko 2002). A mainland find from the Alaska Range represents the southernmost range extention. New to Chukotka.

SPECIMENS EXAMINED. All specimens on dead mosses or organic soil with plant remnants. – **U.S.A. ALASKA:** Alaska Range, Denali National Park Wilderness, headwaters of Hinnes Creek, 63°44'N, 149°07'W, alt. 1200 m, *Dryas*-moss-lichen mountain tundra, 30.viii.2000, *MZ 00323* (hb. MZ), *MZ 00315* (filed under *Dactylospora deminuta*, LE 260148). **RUSSIA. TAIMYR PEN.:** Uboinaya River mouth, 73°36'N, 82°22'E, alt. 20 m, spotty dwarf shrub-lichen-moss tundra, 1.viii.1990, *MZ 90124* (M); 9.viii.1990, *MZ 90525* (hb. MZ); 11.viii.1990, *MZ 901094* (hb. MZ), *MZ 90106* (hb. MZ); Eniseyskii Gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 20–30 m, spotty *Dryas* tundra, 12.vii.1990, *MZ 9099* (H); rocks in tundra, 14.vii. 1990, *MZ 90105* (H). **YAKUTIYA:** East-Siberian Sea coast NW of Indigirka River mouth, Lopatka Pen., N of Bogdashkina River, *Dryas* tundra, 72°10'N, 148°26'E, alt. 15 m, 15.vii.1994, *R. Virtanen* (H). **CHUKOTKA:** N of Anyui Upland, ca. 69°30'N, 163°00'E, alt. 750 m, *Saxifraga bronchialis* tundra, 19.vii.1994, *R. Virtanen* (H); Gil'mymlineiveem River, 65°48'N, 173°15'E, tundra, 19.vii.1977, *I. Makarova* (hb. MZ); E coast of Kolyuchin Inlet, Yuniveem River basin, 66°40'N, 173°54'W, dwarf shrub-lichen-moss tundra, 27.viii.1980, *A. Katenin* (LE 260171, filed under *Protothelenella sphinctrinoides*).

38. *Glypholecia scabra* (Pers.) Müll. Arg.

NOTES. – The species represents a southern element in the Arctic flora. It was reported in the Russian Arctic only from Taimyr Pen. (Kristinsson et al. 2009), based on a previously unpublished record documented below.

SPECIMENS EXAMINED. Both specimens on carbonate rocks in tundra. – **U.S.A. ALASKA:** North Slope, Brooks Range, right bank of Atigun Canyon by the Dalton Highway, 68°27'N, 149°21'W, alt. 950 m, 31.vii.2001, *MZ 01334* (ALA). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, 9.viii.1995, *MZ 95132* (M).

39. *Gowardia arctica* P. Halonen, L. Myllys, S. Velmala & H. Hyvärinen

NOTES. – Halonen et al. (2009) recently created a new genus *Gowardia* P. Halonen, L. Myllys, S. Velmala & H. Hyvärinen for *Alectoria nigricans* (Ach.) Nyl. and divided it into two species, viz. *G. nigricans* (Ach.) P. Halonen, L. Myllys, S. Velmala & H. Hyvärinen and *G. arctica*. I have observed two forms of material referable to *Alectoria nigricans* s. l. throughout the Arctic for many years, but am still uncertain about their taxonomic rank. Due to my observations they can be separated in nature by their color [strongly glossy, gray with brown vs. dull to moderately glossy, ashy gray without brown], probably caused by somewhat different chemistry, but hardly by habitus [contrary to what was stated by Halonen et al. (2009)], ecology or geography. Both taxa are common in the Arctic, but *Gowardia arctica* is probably less frequent. First documented for Arctic Alaska, Taimyr Pen., mainland Arctic Yakutiya, and Chukotka.

SPECIMENS EXAMINED. All specimens on soil, often within lichen-moss mat. – **U.S.A. ALASKA:** Barrow, 71°19'N, 156°37'W, dry lichen-dwarf shrub tundra, 1994, *D.* Walker (hb. MZ). **CANADA. NUNAVUT:** Ellef Ringnes Is., 78°47'N, 103°32'E, alt. 30 m, polygonal tundra, 23.vii.2005, *N. Matveeva* (hb. MZ). **RUSSIA. FRANZ JOSEF LAND** (arctic desert)**:** Alger Is., 80°21'N, 56°13'E, 1.viii.1930, *V. Savicz* (hb. MZ); Scott-Keltie Is., 80°20'N, 52°18'E, 25.vii.1930, *V. Savicz 220* (hb. MZ). **SEVERNAYA ZEMLYA:** Oktyabr'skoi Revolutsii Is., Parizhskoi Kommuny Pen., Cape Vazhnyi, 79°27'N, 93°40'E, alt. 20 m, arctic desert, 30.vii.1985, *M. Gavrilo* (hb. MZ). **TROINOI IS. IN KARSKOE SEA:** 76°00'N, 82°50'E, alt. 20 m, arctic tundra, 12, 19.vii.1992, *Yu. Kozhevnikov* (hb. MZ). **TAIMYR PEN.:** Dikson Is., 73°30'N, 80°20'E, alt. 30 m, arctic tundra, 7.vii. 1990, *MZ 90165* (hb. MZ), *MZ 901117* (hb. MZ); Uboinaya River mouth, 73°36'N, 82°22'E, alt. 10 m, spotty dwarf shrub tundra, 9.viii.1990, *MZ 90197* (hb. MZ); Eniseyskii Gulf, Sibiryakova Is., Glubokaya River mouth, 72°55'N, 78°49'E, wet tundra, 31.vii.1989, *V. Kuvaev* (hb. MZ); same is., Lagernaya River mouth, 72°43'N, 79°05'E, alt. 10 m, in wet lichen-moss-graminoid tundra, 10.vii.1989, *A. Kozhevnikova* (hb. MZ); the same gulf coast, Ragozinka River mouth, 72°48'N, 80°53'E, alt. 30 m, dwarf shrub tundra, 5, 12.vii.1990, *MZ 90177* (hb. MZ), *MZ 90181* (hb. MZ), *MZ 90191* (hb. MZ); same coast, Osipovka River mouth, 72°42'N, 80°51'E, alt. 40 m, stony dwarf shrub tundra, 18.vii.1990, *MZ 901143* (hb. MZ). **YAKUTIYA:** New Siberian Is., Kotel'nyi Is., Balyktakh River, ca. 75°30'N, 140°00'E, arctic tundra, 20.viii.1965, *O. Egorov* (hb. MZ). **CHUKOTKA:** E coast of Kolyuchin Inlet, Yuniveem River basin, 66°40'N, 173°54'W, dwarf shrub-lichen-moss tundra, 23&25.viii.1980, *A. Katenin* (hb. MZ), 10.viii.1980, *A. Katenin* (hb. MZ); 5 km S of Egvekinot, 66°16'N, 179°07'W, alt. 300 m, moss-lichen tundra, 2.ix.2001, *L. Ershova* (hb. MZ); junction of Erguveem and Pepenveem Rivers, 65°55'N, 175°50'W, dwarf shrub tundra, 5.viii.1970, *A. Galanin* (hb. MZ); Vankarem lowland, lower reaches of Kymyneiveem River, alt. 30 m, boggy *Ledum-Carex-Eriophorum*-moss-lichen tundra, 12.viii.1989, *A. Katenin* (hb. MZ).

40. *Gypsoplaca macrophylla* (Zahlbr.) Timdal

NOTES. – The species was formerly known in the Russian Arctic only from Taimyr Pen. (Zhurbenko 2009a). New to Arctic Yakutiya.

SPECIMENS EXAMINED. All specimens on sandy soil, sometimes moss remnants; most of them are referable to f. *blastidiata* Zhurb. – **CANADA. NORTHWEST TERRITORIES:** Banks Is., Green Cabin, 73°13'N, 119°33'W, alt. 75 m, frost boils with cryptogamic crusts 4.vii.2003, *D. Walker* (hb. MZ). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., junction of Krasnaya and Zamknutaya Rivers, 74°36'N, 98°35'E, alt. 250 m, rocks on mountain slope in tundra, 24.viii.1995, *MZ 95161* (hb. MZ); same mts., N of Levinson-Lessinga Lake, 74°34'N, 98°47'E, alt. 250 m, alt. 250 m, carbonate outcrops with tundra, 20.viii.1995, *MZ 95175* (hb. MZ); W of Levinson-Lessinga Lake, 74°30'N, 98°30'E, alt. 140 m, rocky walls of the canyon, 27.viii.1995, *MZ 95160* (hb. MZ); E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, carbonate outcrops with tundra, 9.viii.1995, *MZ 95157* (hb. MZ), *MZ 95158* (M); S of Levinson-Lessinga Lake, 74°24'N, 98°38'E, alt. 160 m, carbonate outcrops with tundra, 1.viii1995, *MZ 95159* (hb. MZ). **YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, open rocks among tundra, 12.viii.1998, *MZ 98188* (hb. MZ), *MZ 98189* (LE-Lichens, M); lower Lena River, Kharaulakh Range, Yuryung-Kysam Urochishche opposite Tit-Ary Is., 71°59'N, 126°19'E, alt. 150 m, open sandstone rocks with tundra, 19.viii.1998, *MZ 98131* (hb. MZ).

41. *Lecanora argentea* Oksner & Volkova
(syn. *Lecanora fuliginosa* Brodo)

NOTE. – New to the Russian Arctic.

SPECIMENS EXAMINED. – **RUSSIA. YAKUTIYA:** Lena River delta, Chekanovskogo Ridge at SW rim of the Lena delta near the Olenek Channel, Khaya Yuryakh Brook Cape, 72°44'N, 123°04'E, alt. 150 m, on debris in tundra,.viii.2000, *G. Grosse* (hb. MZ). **CHUKOTKA:** Televeem River, 65°50'N, 175°05'E, on boulder in tundra, 23.vii.1979, *I. Makarova* (filed under *Dactylospora homoclinella*, LE 261555).

42. *Lecanora baicalensis* Zahlbr.
(syn. *Placolecanora baicalensis* (Zahlbr.) Kopach.)

NOTES. – This species is most common in Central Asia (Golubkova 1981). New to the Arctic.

SPECIMEN EXAMINED. – **RUSSIA. CHUKOTKA:** Amguema River at 174 km of the road Egvekinot-Iul'tin, 67°41'N, 178°35'W, on rocks in steppe-like tundra, 15.viii.1979, *I. Makarova* (filed under *Lichenoconium lecanorae*, LE 261684).

43. *Lecanora crustacea* (Savicz) Zahlbr.
(syn. *Placolecanora crustacea* (Savicz) Kopach.)

NOTES. – The first documented record for Taimyr Pen. (Kopachevskaya 1971), new to Arctic Yakutiya. This insufficiently known species has previously been reported in the Arctic only from Polar Ural (Zhurbenko 1999).

SPECIMENS EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°33'N, 98°36'E, alt. 180 m, on rocks in tundra, 26.viii.1995, *MZ 9599* (M). **YAKUTIYA:** Lena River delta, Bol'shaya Tumatskaya Channel, Amerika-Khaya hill, 72°35'N, 126°18'E, alt. 50 m, on open rocks in tundra, 30.vii.1998, *MZ 98226* (hb. MZ); coast of Sogo Bay of Laptevykh Sea at 5 km S of Tiksi, 71°36'N, 128°58'E, alt. 20 m, on low schist outcrops in tundra, 19.vii.1998, *MZ 98212* (GZU), *MZ 98177* (M).

44. *Lecanora cavicola* Creveld

NOTE. – Known in the Russian Arctic only from Taimyr Pen. (Kristinsson et al. 2009) based on the record documented below.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°32'N, 98°33'E, alt. 300 m, in sandstone rock fissures on mountain slope among tundra, 29.viii.1994, *MZ 9433* (UPS).

45. *Lecanora geophila* (Th. Fr.) Poelt

NOTE. – The species has been infrequently documented in the Russian Arctic.

SELECTED SPECIMENS EXAMINED. All specimens on sandy soil with bryophytes. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°39'W, alt. 800 m, rocks on a slope of a small mountain among tundra, on sandy soil with moss remnants, 28.vii.2001, *MZ 01464* (hb. MZ). **RUSSIA. SEVERNAYA ZEMLYA**: Bol'shevik Is.,W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 10 m, coastal terrace with lichen-bryophyte-graminoid vegetation, locally abundant, 17.vii.1996, *MZ 96625* (hb. MZ). **TAIMYR PEN.:** Byrranga Mts., Krasnaya River, 74°35'N, 98°23'E, alt. 110 m, rock outcrops among tundra, 12.viii.1994, *MZ 94281* (UPS); S of Levinson-Lessinga Lake, 74°24–26'N, 98°46–55'E, alt. 120–250 m, stony tundra, 28.vii.1995, *MZ 9551* (M); 30.vii.1995, *MZ 95175* (hb. MZ). **WRANGEL' IS.:** Neizvestnaya River, 71°09'N, 179°45'W, alt. 155 m, in *Salix lanata* thickets, 4.viii.1995, *S. Kholod* (hb. MZ).

46. *Lecanora leptacina* Sommerf.

NOTE. – New to Lapponia Murmanica Province of Murmansk Region (Urbanavichus et al. 2008).

SPECIMEN EXAMINED. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Dal'nie Zelentsy, 69°07'N, 36°05'E, alt. 20 m, dwarf shrub-moss-lichen tundra, on mosses above boulder, 22.viii.1997, *MZ 97383* (LE 261517).

47. *Lecanora luteovernalis* Brodo

NOTES. – This evidently arctic-alpine species was formerly known in Russia and Asia from one find in Taimyr Pen. (Zhurbenko 2009a). New to South Siberia, Yakutiya and Chukotka.

SPECIMENS EXAMINED. All specimens on bryophytes or detritus. – **CANADA. NUNAVUT:** Ellesmere Is., Sverdrup Pass, 79°08'N, 81°27'W, alt. 360 m, in *Hypno-Cassiopetum tetragonae* vegetation, 27.vii.1992, *F. Daniëls* (FR). **RUSSIA. SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 53°59'N, 95°33'E, alt. 1800 m, *Dryas* mountain tundra over carbonate rocks, 23.vii.2009, *MZ 091* (hb. MZ). **YAKUTIYA:** New Siberian Is., Zhokhov Is., ca. 76°10'N, 152°50'E, alt. 50 m, tundra, 1989, *M. Samarskii* (FR). **CHUKOTKA:** Inchoun, 66°15'N, 170°20'W, stony dwarf shrub tundra, 9.viii.1975, *I. Makarova* (hb. MZ); Lavrentiya Bay, 65°35'N, 171°00'W, dwarf shrub-lichen-moss tundra, 10, 19.vii.1973, *I. Makarova* (hb. MZ); *Salix*-moss-lichen tundra, 19.vii.1973, *I. Makarova* (hb. MZ).

48. *Lecanora orae-frigidae* R. Sant.

NOTE. – New to Lapponia Murmanica Province of Murmansk Region (Urbanavichus et al. 2008).

SPECIMEN EXAMINED. – **RUSSIA. MURMANSK REGION:** Barents Sea coast, Dal'nie Zelentsy, c. 69°07'N, 36°05'E, alt. 5 m, on naked drift-wood, 4.ix.1997, *MZ 9787* (M).

49. *Lecanora zosterae* (Ach.) Nyl.

NOTE. – A rarely reported species in the Russian Arctic.

SPECIMENS EXAMINED. Both specimens on dead dwarf shrubs. – **RUSSIA. WRANGEL' IS.:** Gusinaya River, 71°07'N, 179°21'E, alt. 180 m, spotty *Dryas* tundra, 19.viii.1991, *S. Kholod* (M); Neizvestnaya River, 71°14'N, 179°16'W, alt 180 m, dwarf shrub tundra, 9.viii.1987, *S. Kholod* (M).

50. *Lecidea alpestris* Sommerf.

NOTE. – New to Severnaya Zemlya.

SPECIMENS EXAMINED. All specimens on hepatics, sometimes with sandy soil. – **RUSSIA. SEVERNAYA ZEMLYA**: Bol'shevik Is., Cape Antseva, 78°12'N, 103°17'E, alt. 30 m, arctic desert, boulder field, 19, 24.vii.2000, *N. Matveeva* (hb. MZ). **WRANGEL' IS.:** Gusinaya River, 71°11'N, 179°09'E, alt. 475 m, stony lichen tundra, 24.vii.1991, *S. Kholod* (M); Neozhidannaya River, 71°00'N, 179°10'E, alt. 220 m, stony lichen tundra, 14.viii.1992, *S. Kholod* (H); Krasnyi Flag River, 71°20'N, 178°52'W, alt. 260 m, stony lichen tundra, 28.vii.1997, *S. Kholod* (H).

51. "*Lecidea*" *diapensiae* Th. Fr.

NOTES. – Ascospores (0–)1(–2)-septate. New to Arctic Alaska and Yakutiya (Andreev 1998, Thomson 1997).

SPECIMENS EXAMINED. All specimens on dead leaves of *Diapensia* spp. in various dwarf shrub tundras. – **U.S.A. ALASKA:** Seward Pen., 7 km NE of Nome, Newton Peak, 64°33'N, 165°22'W, alt. 250 m, 5.ix.2001, *MZ 01127* (M); North Slope, Toolik Lake, 68°37'N, 149°36'W, alt. 800 m, moss-lichen-dwarf shrub tundra, 28.vii.2001, *MZ 01571* (hb. MZ). **NORWAY. TROMS CO.:** Skibotndalen Valley, Lavkajavri, 69°13'N, 20°29'E, alt. 650 m, 8.viii.2003, *MZ 03148* (M). **RUSSIA. MURMANSK REGION:** Barents Sea coast, 4 km SSE of Dal'nie Zelentsy, 69°07'N, 36°05'E, alt. 100 m, 21.viii. 1997, *MZ 97130* (GZU); same coast, Olenka River mouth, 69°02'N, 36°25'E, alt. 50 m, 5.ix.1997, *MZ 97113* (M). **YAKUTIYA:** Laptevykh Sea coast, 3 km NW of Tiksi town, 71°39'N, 128°45'E, alt. 70 m, 24.viii.1998, *MZ 98118* (M); Indigirka River, 8 km SW of Ust'-Nera, Dva brata Mt., 64°31'N, 143°08'E, alt. 1250 m, mountain tundra, 23.vii.1992, *MZ 92516* (M). **CHUKOTKA:** middle Palyavaam River near Palyavaam settlement, 68°44 N, 173°50 E, 21.viii.1989, *A. Davydov* (M); Bezymyannoe Lake, 66°39'N, 176°40'E, 11.vii.1979, *I. Makarova* (M); Lunnaya River at 115 km of the road Egvekinot-Iul'tin, 67°05'N, 178°47'W, 29.vii.1970, *I. Makarova* (hb. MZ); Puoten Bay, 65°50'N, 170°30'W, 18.vii.1972, *I. Makarova* (hb. MZ).

52. "*Lecidea*" *epiphaea* Nyl.

(syn. *L. collodea* (Th. Fr.) Leight.)

NOTE. – A rarely reported in the Russian Arctic (Andreev 1998).

SPECIMENS EXAMINED. All specimens on bryophytes. – **RUSSIA. SEVERNAYA ZEMLYA**: Bol'shevik Is., Cape Antseva, 78°12'N, 103°17'E, alt. 30 m, wet herb-bryophyte-lichen arctic desert, 11, 28.viii.2000, *N. Matveeva* (hb. MZ) [det. C. Printzen, 2003]. **TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°24'N, 98°49'E, alt. 120 m, stony tundra, 29.vii.1995, *MZ 95179* (FR) [det. C. Printzen, 2003]. **CHUKOTKA:** Bezymyannoe Lake, 66°39'N, 176°40'E, 11.vii.1979, 9.vii. 1979, *I. Makarova* (hb. MZ).

53. *Lecidea polytrichinella* Hertel, Obermayer & Poelt

NOTES. – Thallus inconspicuous. Apothecia subglobose, constricted at the base, dark brown to blackish, not pruinose, up to 0.25 mm diam., C+ reaction not observed, K-. Ascospores colorless, simple, narrowly ellipsoid, 5.5–8.5 × 2.5–3.5 µm. The species was formerly known in the Arctic only from Svalbard. New to Russia and Asia (Andreev 1998).

SPECIMEN EXAMINED. – **TAIMYR PEN.:** NW coast of Pyasino Lake, N'yapan hills, 70°05'N, 87°44'E, alt. 70 m, *Betula nana*-lichen-moss tundra, on *Polytrichum* sp., viii.1999, *L. Zanokha* (M) [rev. H. Hertel, 2000].

54. *Lecidea umbonata* (Hepp) Mudd

NOTE. – New to Central Siberia (Andreev 1998).

SPECIMENS EXAMINED. All specimens on rocks; filed under *Muellerella erratica*. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 250 m, rocks in tundra, 30.viii.1995, *MZ 95564* (LE 261664); E of Levinson-Lessinga Lake, 74°29'N, 98°39'E, alt. 250 m, carbonate outcrops in tundra, 9.viii.1995, *MZ 95563* (LE 261564). **YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, rocks among tundra, 12.viii.1998, *MZ 98399* (LE 261754).

55. *Lobaria epovae* Makryi

NOTES. – The species is close to *Lobaria pseudopulmonaria* Gyeln., a widely amphi-Beringian species, known in the Arctic from Alaska (Thomson 1984). Distinction between these species needs further investigation. *Lobaria epovae* was formerly known only from subalpine habitat in Khamar-Daban Range of Baikal Siberia (Makryi 1993; isotype: 19.viii.1989, *T. Makryi*, LE-Lichens!). New to the Arctic and Yakutiya.

SPECIMEN EXAMINED. – **RUSSIA. YAKUTIYA:** Laptevykh Sea coast, 1 km S of Tiksi, 71°37'N, 128°54'E, alt. 70 m, Lyal'kin Pup Mt., mesic(-moist) knobby dwarf shrub moss lichen tundra, on mossy soil, 18.vii.1998, *MZ 98191* (M).

56. *Lobaria scrobiculata* (Scop.) DC.

NOTE. – The species represents a southern element in the Arctic flora, known there from sporadic finds (Brodo et al. 2001).

SPECIMENS EXAMINED. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°39'W, alt. 850 m, upper portion of a small mountain slope with dwarf shrub tundra, on mossy shaded rocks, occasionally also on *Salix* bark, 1.viii.2001, *MZ 01345* (ALA). **RUSSIA. CHUKOTKA:** Ioni Lake, 65°53'N, 173°44'W, stony lichen-forb tundra on Yanraponta Mt. slope, over stone, partly on bryophytes, 9.vii.1979, *I. Makarova* (M).

57. *Massalongia carnosa* (Dickson) Körb.

NOTES. – Formerly known in the Russian Arctic only from Kola Pen. New to Chukotka.

SPECIMENS EXAMINED. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°39'W, alt. 850 m, stony mountain slopes with dwarf shrub tundra, on stones among lichens and mosses, 28.vii.2001, *MZ 01491* (hb. MZ); 1.viii.2001, *MZ 01346* (ALA). – **RUSSIA. CHUKOTKA:** Provideniya, E slope of Portovaya Mt., 64°27'N, 173°12'W, alt. 200 m, abundant above boulder in dwarf shrub-moss-lichen tundra, 23.viii.2001, *MZ 01182* (M).

58. *Nephroma parile* (Ach.) Ach. var. *parile*

NOTE. – The first verified report for Taimyr Pen.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°26'N, 98°55'E, alt. 250 m, rocks and boulders on S-exposed mountain slope, on mossy soil, 28.vii.1995, *MZ 9546* (M).

59. *Pannaria hookeri* (Borrer ex Sm.) Nyl.

NOTE. – New to Franz Josef Land.

SPECIMENS EXAMINED. All specimens on rock or on mineral soil or bryophytes over stones. – **RUSSIA. FRANZ JOSEF LAND:** Hooker Is., 80°20'N, 52°52'E, arctic desert, 2.viii.1930, *V. Savicz* (LE-Lichens). **SEVERNAYA ZEMLYA:** Bol'shevik Is., Cape Antseva, 78°13'N, 103°15'E, alt. 20–80 m, arctic desert, 31.vii.1997, *N. Matveeva* (M); 16.viii.2000, *N. Matveeva* (hb. MZ). **TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 200 m, rocks in tundra, 15.viii.1995, *MZ 95126* (M).

60. *Parmeliella triptophylla* (Ach.) Müll. Arg.

NOTE. – New to Polar Ural.

SPECIMENS EXAMINED. – **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°56'N, 65°35'E, alt. 600 m, rock outcrops among mountain tundra, on decaying twig of a dwarf shrub on soil, 26.vi.1993, *MZ 9368* (hb. MZ). **SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°41'E, alt. 40 m, arctic desert, on moribund bryophytes, 18.vii.1996, *MZ 96689* (hb. MZ). **RUSSIA. TAIMYR PEN.:** lower Pravaya Uboinaya River, "217" Mt., 73°26' N, 82°43' E, alt. 150 m, stone mountain slope with dwarf shrub tundra, on lichen-moss detritus over rock, 5.viii.1990, *MZ 90689* (hb. MZ).

61. *Peltigera elisabethae* Gyeln.

NOTE. – New to Arctic Yakutiya.

SPECIMEN EXAMINED. – **RUSSIA. YAKUTIYA:** Lena River delta, Samoilovskii Is., 72°22'N, 126°29'E, alt. 10 m, drained terrace margin, mesic forb-*Dryas*-lichen-moss tundra, on sandy soil in dry shallow polygonal trench, 30.vii.1998, *MZ 98153* (M).

62. *Peltigera lyngei* Gyeln.

NOTE. – This insufficiently known arctic species is new to Franz Josef Land (Vitikainen 1994).

Specimens Examined. – **RUSSIA. FRANZ JOSEF LAND:** Alger Is., 80°21'N, 56°13'E, arctic desert, mountain slope, on sandy soil, 1.viii.1930, *V. Savicz* (LE-Lichens); Northbrook Is., Cape Flora, 80°11'N, 50°14'E, mountain slope below bird colony, on mosses, 28.vii.1930, *V. Savicz* (LE-Lichens).

63. *Pertusaria saximontana* Wetmore

Note. – This rare Holarctic mountainous species is new to Sayan Mts. (Zhurbenko & Lumbsch 2006).

Specimen Examined. – **RUSSIA. SAYAN MTS.:** Kryzhina Range, headwaters of Belyi Kitat River, 54°01'N, 95°27'E, alt. 1750 m, *Dryas* mountain tundra, on bases of *Carex* tufts and soil, 16.vii.2009, *MZ 093* (hb. MZ).

64. *Phylliscum demangeonii* (Moug. & Mont.) Nyl.

Note. – New to Arctic Alaska, Polar Ural and Taimyr Pen.

Specimens Examined. All specimens on stone. – **U.S.A. ALASKA:** Cape Krusenstern National Monument, Tahinichok Mts., 67°36'N, 163°43'W, alt. 425 m, barren, 12.vii.2003, *M. Emers* (hb. MZ). **RUSSIA. POLAR URAL:** Rai-Iz Mt., 66°56'N, 65°35'E, alt. 600 m, rock outcrops among mountain tundra, 26.vi.1993, *MZ 9369* (hb. MZ). **TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°26'N, 98°55'E, alt. 250 m, boulders, 28.vii.1995, *MZ 95148* (hb. MZ). **CHUKOTKA:** Provideniya District, middle Nunyamuveem River, Klyuchevoi Creek, 65°20'N, 175°34'W, tundra near hot springs, 19.viii.1985, *A. Katenin* (M).

65. *Pilophorus cereolus* (Ach.) Th. Fr.

Note. – New to Taimyr Pen.

Specimen Examined. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°27'E, alt. 450 m, flat stony top of a mountain, on wet scree, 10.viii.1995, *MZ 95149* (hb. MZ).

66. *Pilophorus dovrensis* (Nyl.) Timdal, Hertel & Rambold

Note. – The species is known in the Russian Arctic from a few finds at Taimyr Pen. and Severnaya Zemlya.

Specimens Examined. – **NORWAY. SVALBARD:** Nordenskiöld Land, W coast of Grønfjorden near Aldegondabreen glacier, 78°00'N, 14°12'E, alt. 100 m, moraine with dwarf shrub tundra, on mineral soil, 16.vii.2003, *MZ 03259* (hb. MZ). **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., between Shokal'skogo Strait and Mikoyana Bay, 79°17'N, 101°50'E, alt. 40 m, arctic desert, on mineral soil with scree, 20.vii.1996, *MZ 96751* (hb. MZ).

67. *Pilophorus robustus* Th. Fr.

Note. – The species is known in Severnaya Zemlya (Zhurbenko & Matveeva 2006) from a single find documented below.

Specimens Examined. All specimens on scree. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°18–36'W, alt. 750–800 m, stony moss-lichen-dwarf shrub tundra on top of a hill, 26.vii.2001, *MZ 01588* (M); on pebble by a stream among low willow shrubs, 28.vii.2001, *MZ 01459*. **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., Cape Antseva, 78°12'N, 103°17'E, alt. 20 m, wet arctic desert, 28.vii.2000, *N. Matveeva* (hb. MZ). **TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°27'E, alt. 450 m, wet flat top of a mountain, 10.viii.1995, *MZ 95149* (hb. MZ). **CHUKOTKA:** Baran'e Lake, 66°54'N, 175°15'E, tundra, 2.viii.1980, *I. Makarova* (hb. MZ).

68. *Placidiopsis pseudocinerea* Breuss

Note. – New to the Canadian Arctic.

Specimens Examined. – **CANADA. NORTHWEST TERRITORIES:** Banks Is., Green Cabin, 73°13'N, 119°33'W, alt. 75 m, cryptogamic crust on frost boils, on sand, 10.vii.2003, *D. Walker* (hb. MZ). **RUSSIA. SEVERNAYA ZEMLYA:** W coast of Akhmatova Bay, 79°04'N, 102°45E, alt. 20 m, *Dryas-Salix polaris*-lichen-bryohyte arctic desert, on sandy soil with moss remnants, 17.vii.1996, *MZ 96579* (hb. MZ).

69. *Pleopsidium chlorophanum* (Wahlenb.) Zopf

NOTE. – New to Taimyr Pen.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°40'E, alt. 350 m, on rocks in tundra, 16.viii.1995, *MZ 9585* (M).

70. *Protothelenella leucothelia* (Nyl.) H. Mayrhofer & Poelt

NOTE. – New to Yamal-Gydan Region of the Arctic.

SPECIMEN EXAMINED. – **RUSSIA. YAMAL-NENETZ REGION:** S of Nadym, 65°19'N, 72°52'E, hummock tundra patch in forest-tundra complex, on mosses, 8.viii.2007, *D. Walker* (hb. MZ); between Taz and Pur River, sparse *Larix* forest, on soil, 5.viii.1990, *G. Vil'chek* (hb. MZ).

71. *Protothelenella sphinctrinoidella* (Nyl.) H. Mayrhofer & Poelt

NOTE. – A rarely documented Arctic species.

SPECIMEN EXAMINED. – **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., middle Studenaya River, 78°37'N, 101°05'E, alt. 250 m, arctic desert, on bryophytes, 16.viii.1998, *N. Matveeva* (hb. MZ).

72. *Psilolechia clavulifera* (Nyl.) Coppins

NOTE. – Until recently the species was known in Russia only from the unpublished report documented below (Kotlov 1998).

SPECIMEN EXAMINED. – **RUSSIA. PSKOV REGION:** 27 km SSW of Gdov, Chernevo, 58°39'N, 28°14'E, alt. 60 m, mixed forest, on sandy soil at the base of fallen *Picea abies*, associated with *Chaenotheca furfuracea*, 6 XI 1996, *MZ 963* (hb. MZ).

73. *Psora elenkinii* Rass.

NOTES. – The species is close to *Psora himalayana* (C. Bab.) Timdal and was sometimes treated as its synonym (Hertel 2000, Timdal 1986). The latter species has been reported from Arctic Alaska. New to North America, North-East of Russia and the Arctic (Golubkova 2008).

SPECIMENS EXAMINED. All specimens on rocks (mostly carbonate) in dwarf shrub tundra, growing directly on rock or on soil deposits or occasionally mosses above it. – **U.S.A. ALASKA:** North Slope, Brooks Range, Atigun Canyon by the Dalton Highway, 68°27'N, 149°21'W, alt. 950–1200 m, mountain slope, 31.vii.2001, *MZ 01372* (ALA), *01373* (hb. MZ). **RUSSIA. WRANGEL' IS.:** upper Neizvestnaya River, 71°10'N, 179°25'W, alt. 100 m, 11.vii.1986, *A. Dobrysh* (hb. MZ). **CHUKOTKA** [all specimens rev. by E. Timdal, 2003]**:** Erguveem River, 65°55'N, 175°50'W, 8.vii.1967, *E. Zimarskaya* (hb. MZ); Lavrentiya Bay, 65°35'N, 171°00'W, 11, 15, 16, 28.vii.1973, *I. Makarova* (hb. MZ).

74. *Psora himalayana* (C. Bab.) Timdal

NOTE. – A scarcely documented species in the Russian Arctic (see notes under *Psora elenkinii*) (Golubkova 2008).

SPECIMEN EXAMINED. – **RUSSIA. YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, on sandy soil in open S-exposed diabase rocks among tundra, 12.viii.1998, *MZ 98161* (M).

75. *Psora luridella* (Tuck.) Fink

NOTES. – Previously known in the Arctic only from its Canadian portion (Zhurbenko & Daniëls 2003). New to Alaska (Timdal 1986).

SPECIMENSS EXAMINED. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°39'W, alt. 850 m, on rocks on mountain slope amongst moss-lichen-dwarf shrub tundra, on sandy soil with moss remnants, 1.viii.2001, *MZ 01630* (ALA).

76. *Psora nipponica* (Zahlbr.) Gotth. Schneider

Specimens Examined. – **CANADA. BRITISH COLUMBIA:** Wells Gray Provincial Park, Trophy Mt., 51°48'N, 119°52'W, alt. 2300 m, rocks in mountain tundra, on mossy in rock fissures, 7.vii.2002, *MZ 02269* (hb. MZ). **RUSSIA. CHUKOTKA:** Sireniki, 64°24'N, 173°54'W, mountain slope, on sand deposits in rocks in tundra, 17.vii.1983, *I. Makarova* (hb. MZ).

77. *Psora vallesiaca* (Schaer.) Timdal

Note. – New to the Russian Arctic (Golubkova 2008).

Specimens Examined. All specimens on sandy soil. – **CANADA. NORTHWEST TERRITORIES:** Prince Patrick Is., 2 km SE of Mould Bay station, 76°14'N, 119°18' W, dry, bare frost boils, 22.vii.2004, *D. Walker* (hb. MZ); Banks Is., Green Cabin, 73°13'N, 119°33'W, alt. 70 m, frost boils, 8.vii.2003, *D. Walker* (M). **YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, open S-exposed diabaz rocks among tundra, 12.viii.1998, *MZ 98161* (M); lower Lena River, Kharaulakh Range, Yuryung-Kysam Urochishche opposite Tit-Ary Is., 71°59'N, 126°19'E, alt. 150 m, dry sandstone rocks among tundra, 19.viii.1998, *MZ 98225* (hb. MZ).

78. *Psorinia conglomerata* (Ach.) Gotth. Schneider

Note. – New to Magadan Region of Russia (Andreev 2008a).

Specimens Examined. – **RUSSIA. TAIMYR PEN.:** N of Levinson-Lessinga Lake, 74°31'N, 98°33'E, alt. 300 m, on rocks, 24.vii.1995, *MZ 9539* (M) [confirm. H. Hertel, 2000]. **MAGADAN REGION:** Gerba at 20 km SSE of Orotukan, 62°06'N, 151°51'E, alt. 650 m, on rocks, 27.vii.1992, *MZ 92213* (hb. MZ).

79. *Psoroma tenue* Henssen var. *boreale* Henssen

Notes. – This is evidently a widespread, but long overlooked in the Arctic species. New to Franz Josef Land and Wrangel' Is. (Jørgensen 2004)

Specimens Examined. – **RUSSIA. FRANZ JOSEF LAND:** Alger Is., 80°21'N, 56°13'E, arctic desert, on soil, 1.viii. 1930, *V. Savicz 1861* (LE 260168, filed under *Cercidospora punctillata*); Scott-Keltie Is., 80°20'N, 52°18'E, on mossy soil, 25.vii.1930, *V. Savicz* (hb. MZ). **WRANGEL' IS.:** middle Neizvestnaya River, 71°21'N, 179°34'W, *Dryas* tundra, on soil, 26.vii.1987, *B. Yurtsev* (LE 260198, filed under *Dactylospora deminuta*).

80. *Psorula rufonigra* (Tuck.) Gotth. Schneider

Notes. – The species represents a southern element in the Arctic, where it was formerly known only from southern Greenland (Brodo et al. 2001, Thomson 1997). This is the first documented report for the American Arctic and Alaska.

Specimen Examined. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°39'W, alt. 850 m, on non-carbonate rocks on mountain slope amongst moss-lichen-dwarf shrub tundra, 1.viii.2001, *MZ 01642* (hb. MZ).

81. *Ramalina almquistii* Vain.

Note. – A rarely reported species in the Russian Arctic.

Specimens Examined. All specimens on soil often in lichen-moss mat. – **U.S.A. ALASKA:** North Slope, Brooks Range, Atigun Canyon by the Dalton Highway, 68°27'N, 149°21'W, alt. 900 m, mountain slope with dry spotty moss-lichen-*Dryas* tundra, on soil, 31.vii.2001, *MZ 01377* (ALA). **CANADA. NUNAVUT:** Victoria Is., Cambridge Bay, Pelly Mt., 69°06'N, 105°07'W, tundra, 7.viii.1999, *N. Matveeva* (M). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°24'N, 98°33'E, alt. 150 m, tundra over carbonates, 1.viii.1995, *MZ 9566* (M). **YAKUTIYA:** Lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas*-lichen-moss tundra, 4.viii.1998, *MZ 98392* (hb. MZ); Laptevykh Sea coast, 1 km S of Tiksi, 71°37'N, 128°54'E, alt. 100 m, slope of Lyal'kin Pup Mt., moss-lichen-dwarf shrub tundra, 18.vii.1998, *MZ 98218* (hb. MZ). **WRANGEL' IS.:** Somnitel'naya River, 71°59'N, 179°38'W, alt. 140 m, spotty lichen-*Dryas* tundra, 25.vii.1984, *S. Kholod* (M). **CHUKOTKA:** Enmyvaam River, 68°15'N, 166°03'E, scree forb-lichen tundra, 30.vi.1980, *I. Makarova* (M); Lavrentiya Bay, 65°35'N, 171°00'W, dwarf shrub-lichen-moss tundra, 24.viii. 1975, *I. Makarova* (hb. MZ).

82. *Rhexophiale rhexoblephara* (Nyl.) Hellb.

NOTE. – New to Arctic Yakutiya, the first verified record for Yamal-Gydan Region.

SPECIMENS EXAMINED. All specimens on bryophytes or occasionally on plant remnants. – **U.S.A. ALASKA:** North Slope, Toolik Lake, 68°37'N, 149°18'W, alt. 800 m, moss-lichen-dwarf shrub tundra on a stony hill, on loamy soil with moss remnants, 26.vii.2001, *MZ 01584* (ALA). **RUSSIA. YAMAL PEN.:** Bovanenkova gas field, Vas'kiny Dachi, 70°18'N, 68°53'E, dwarf shrub-moss-lichen tundra, 25.viii.2007, *D. Walker* (hb. MZ). **RUSSIA. SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°41'E, alt. 40 m, 18.vii.1996, *MZ 96510* (hb. MZ), *MZ 96738* (hb. MZ); same is., Cape Antseva, 78°12'N, 103°17'E, alt. 40 m, 17.viii.2000, *N. Matveeva* (hb. MZ). **YAKUTIYA:** Laptevykh Sea coast, 3 km SW of Tiksi, 71°40'N, 128°40'E, alt. 50 m, moss-lichen-dwarf shrub tundra, 17.vii.1998, *MZ 98184* (M). **WRANGEL' IS.:** Vulfson Bay coast, 71°28'N, 178°13'W, alt. 2 m, spotty *Deschampsia borealis*-lichen tundra, 31.viii.1998, *S. Kholod* (M).

83. *Rhizocarpon umbilicatum* (Ramond) Flagey

NOTE. – New to Chukotka and Beringian Alaska.

SPECIMENS EXAMINED. – **U.S.A. ALASKA:** Cape Krusenstern National Monument, Noak Mt., 67°09'N, 163°01'W, alt. 291 m, *Dryas* tundra, on stone, 11.vii.2003, *M. Emers* (filed under *Phaeospora parasitica*, LE 261620). **RUSSIA. CHUKOTKA:** Yanrakynnot, Marich River, 64°53'N, 172°30'W, on carbonate rock, 30.vii.1986, *A. Katenin* (filed under *Merismatium coccisporum*, LE 261594).

84. *Schadonia fecunda* (Th. Fr.) Vězda & Poelt

NOTE. – A scarcely documented species in the Arctic.

SPECIMENS EXAMINED. All specimens on bryophytes. – **RUSSIA. SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, 15.vii.1996, *MZ 96534* (hb. MZ); same is., W coast of Mikoyana Bay, 79°18'N, 101°55'E, alt. 10 m, 21.vii.1996, *MZ 96762* (hb. MZ). **WRANGEL' IS.:** Tundrovaya River, 71°17'N, 179°50'W, alt. 140 m, forb-*Artemisia tilesii* tundra, 23.viii.1995, *S. Kholod* (M); Krasnyi Flag River, 71°27'N, 178°53'W, alt. 20 m, spotty moss-*Salix polaris* tundra, 31.viii.1997, *S. Kholod* (H).

85. *Seirophora contortuplicata* (Ach.) Frödén

NOTE. – This arcto-alpine species is known in the Russian Arctic only from the previously unpublished materials documented below and in the American Arctic only from Reindeer Preserve, Northwest Territories, Canada (Ahti et al. 1973, Kristinsson et al. 2009, Zhurbenko 1996). New to Alaska.

SPECIMENS EXAMINED. All specimens on rocks (mostly carbonate) among dwarf shrub tundra, directly on rock or on soil or moribund mosses above it. – **U.S.A. ALASKA:** North Slope, Brooks Range, Atigun Canyon by the Dalton Highway, 68°27'N, 149°21'W, alt. 1200 m, on carbonate rocks on a mountain slope among tundra, 31.vii.2001, *MZ 01388* (ALA). **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°40'E, alt. 200 m, 15.viii.1995, *MZ 95163* (hb. MZ); same mts., Krasnaya River, 74°35'N, 98°20'E, alt. 150 m, 12.viii.1995, *MZ 95164* (hb. MZ); same mts., N of Levinson-Lessinga Lake, 74°31–34'N, 98°26–47'E, alt. 120–300 m, 24.vii.1995, *MZ 95165* (hb. MZ); 26.viii.1995, *MZ 95166* (hb. MZ); 3.viii.1994, *MZ 9436* (UPS); 20.viii.1995, *MZ 9589* (M). **YAKUTIYA:** Lena River delta, Stolb Is., 72°24'N, 126°40'E, alt. 100 m, 12.viii.1998, *MZ 98167* (M).

86. *Siphula ceratites* (Wahlenb.) Fr.

NOTES. – In accordance with its general distribution pattern the species is fairly common on the Taimyr coast and neighbouring islands and was formerly not found in its inner regions (Zhurbenko 1996). The find documented below on a mountain top about 200 km from the nearest Taimyr coast may be hypothesized as a relict of Pleistocene marine transgressions on the peninsula.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°40'E, alt. 350 m, flat mountain top, spotty *Novosiversia glacialis*-tundra, locally very abundant on wet soil with plant remnants between pools, 18.viii.1995, *MZ 95108* (M).

87. *Solorina bispora* Nyl. var. *subspongiosa* (Zschacke) Frey

NOTES. – This variety, which has recently been reported new to the Russian Arctic (Zhurbenko & Matveeva 2006), proved to be fairly common there. New to Taimyr Pen. and Arctic Yakutiya.

SELECTED SPECIMENS EXAMINED. All specimens on mineral soil, occasionally on bryophytes. – **CANADA. NUNAVUT:** Ellesemere Is., Eureka, 80°06'N, 85°38'W, scree *Dryas* tundra, 30.vii.1999, *N. Matveeva* (filed under *Pronectria robergei*, LE 260160). **RUSSIA. SEVERNAYA ZEMLYA** (arctic desert): Bol'shevik Is., Shokal'skogo Strait coast, 79°16'N, 101°40'E, alt. 20 m, 15.vii.1996, *MZ 96403* (hb. MZ); same is., W coast of Akhmatova Bay, 79°04'N, 102°45'E, alt. 10 m, lichen crusts, 17.vii. 1996, *MZ 96400* (hb. MZ); same is., Cape Antseva, 78°12'N, 103°17'E, alt. 10 m, wet *Gymnomitrion corallioides* vegetaion, 24.vii.2000, *N. Matveeva* (hb. MZ); 17.viii.2000, *N. Matveeva* (hb. MZ). **TAIMYR PEN.** (all specimens filed under *Pronectria robergei*)**:** Byrranga Mts., Zamknutaya River, 74°37'N, 98°33'E, alt. 150 m, rocks in tundra, 6.viii.1995, *MZ 95474* (LE 233942); *MZ 95475* (LE 233903); same mts., N of Levinson-Lessinga Lake, 74°31'N, 98°36'E, alt. 300–500 m, scree tundra, 20.viii.1995, *MZ 95501:b* (LE 260299:b). **YAKUTIYA:** Lower Lena River, NW extremity of Primorskii Range, Stolb meteostation, 72°22'N, 126°42'E, alt.50 m, spotty *Dryas* tundra, 4.viii.1998, *MZ 98368* (LE 260100); Indigirka River, 48 km NNW of Tyubelyakh, 65°48'N, 142°53'E, alt. 250 m, carbonate outcrops in sparse *Larix* forest, 20.vii.1992, *MZ 92562* (filed under *Scutula tuberculosa*, LE 233972).

88. *Squamarina lentigera* (Weber) Poelt

NOTE. – New to the Russian Arctic.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., Bol'shaya Bootankaga River, 74°30'N, 97°45'E, alt. 160 m, foot of rocks by the river bank, on sandy soil, 15.viii.1995, *MZ 95129* (hb. MZ).

89. *Stereocaulon arenarium* (Savicz) I.M. Lamb

NOTE. – New to Franz Josef Land.

SPECIMENS EXAMINED. All on sand in arctic desert. – **RUSSIA. FRANZ JOSEF LAND:** Hooker Is., Tikhaya Bay, 80°20'N, 52°52'E, 23.vii.1930, *V. Savicz* (LE-Lichens). **VIZE IS.:** 79°32'N, 76°50'E, 14.viii.1930, *V. Savicz* (LE-Lichens).

90. *Stereocaulon capitellatum* H. Magn.

NOTE. – A rare species on Svalbard (Elvebakk & Hertel 1996).

SPECIMEN EXAMINED. – **NORWAY. SVALBARD:** Nordenskiöld Land, E coast of Grønfjorden, 4 km S of Barentsburg, 78°02'N, 14°19'E, alt. 20 m, spotty dwarf shrub-lichen-moss tundras, on loamy soil, 13.vii.2003, *MZ 03270* (hb. MZ).

91. *Stereocaulon intermedium* (Savicz) H. Magn.

NOTE. – New to Taimyr Pen.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., N of Levinson-Lessinga Lake, 74°31'N, 98°33'E, alt. 300 m, on stone in tundra, 30.viii.1995, *MZ 95111* (M).

92. *Stereocaulon symphycheilum* I.M. Lamb

NOTE. – New to Taimyr Pen.

SPECIMEN EXAMINED. – **RUSSIA. TAIMYR PEN.:** Byrranga Mts., S of Levinson-Lessinga Lake, 74°26'N, 98°55'E, alt. 250 m, on boulder among tundra, 28.vii.1995, *MZ 95121* (hb. MZ).

93. *Toninia arctica* Timdal

NOTE. – A scarcely documented Arctic species.

SPECIMEN EXAMINED. **CANADA. NORTHWEST TERRITORIES:** Banks Is., Green Cabin, 73°13'N, 119°33'W, alt. 70 m, frost boils, on sandy soil, 8.vii.2003, *D. Walker* (hb. MZ).

94. *Usnea sphacelata* (Hook. f. & Taylor) R. Br.

NOTE. – This species is scarcely documented in the Russian Arctic.

SPECIMEN EXAMINED. – **RUSSIA. YAKUTIYA:** New Siberian Is., Bennetta Is., E of Zeberga Glacier, 76°40'N, 149°00'E, alt. 160 m, arctic desert, locally abundant on stones on the coastal terrace margin, 31.vii.1989, *MZ 8955* (F).

95. *Vahliella leucophaea* (Vahl) P.M. Jørg.

NOTE. – The species has been rarely documented in the Arctic.

SPECIMEN EXAMINED. – **RUSSIA. SEVERNAYA ZEMLYA:** Bol'shevik Is., W coast of Akhmatova Bay, 79°04'N, 102°41'E, alt. 40 m, mesic silt-gravelly flat coastal plain with sparse lichen-bryophyte vegetation, locally abundant on on dead mosses, 15.vii.1996, *MZ 96684* (hb. MZ).

RESULTS AND DISCUSSION

This catalogue presents and annotates finds of 141 species of lichenicolous fungi, 12 species of lichenicolous lichens and 94 species of biogeographically interesting non-lichenicolous lichens, mainly from the Russian Arctic. *Corticifraga fusispora* sp. nov. (on *Peltigera*), *Odontotrema japewiae* sp. nov. (on *Japewia*), and *Opegrapha pulvinata* var. *placidiicola* var. nov. (on *Placidium*) are described from Russia. *Dactylospora rinodinicola* is reduced to synonymy with *Dactylospora deminuta*.

Most taxa are new to various regions of the Holarctic. On a larger scale these are as follows. **New to North America:** *Didymellopsis latitans*, *Epilichen glauconigellus, Polycoccum bryonthae, Psora elenkinii, Stigmidium solorinarium*, and *Unguiculariopsis refractiva*. **New to Asia and Russia:** *Adelococcus alpestris, Arrhenia peltigerina, Arthrorhaphis olivacea, Buellia lecanoricola, Epibryon solorinae, Hobsoniopsis santessonii, Lecidea polytrichinella*, *Lichenochora coppinsii, L. elegantis, Muellerella atricola, Odontotrema cuculare, Opegrapha geographicola*, *Phaeoseptoria peltigerae, Phoma denigricans, P. physciicola, Polydesmia lichenis, Pronectria walkerorum, Rhagadostoma brevisporum, Roselliniella pannariae, Sclerococcum montagnei, Scutula dedicata, Tremella christiansenii, Trichosphaeria lichenum, Unguiculariopsis thallophila, Weddellomyces protearius, Zwackhiomyces immersae*, and *Z. physciicola*. **New to Asia, but not Russia:** *Capronia peltigerae, Dacampia rufescentis, Lasiosphaeriopsis salisburyi, Lichenochora weillii, Pronectria minuta, P. tibellii, Reconditella physconiarum, Skyttea tephromelarum, Stigmidium mitchellii*, and *Xenonectriella ornamentata*. **New to Russia, but not Asia:** *Chaenothecopsis parasitaster, Polycoccum crassum, Rhymbocarpus geographici, Stigmidium psorae* (the first verified record), *S. squamariae, Vouauxiomyces santessonii*, and *Zwackhiomyces coepulonus*. **New to Kyrgyzstan:** *Stigmidium solorinarium*. **New to Mongolia:** *Cercidospora verrucosaria*. **New to the Arctic:** *Aspicilia transbaicalica, Dactylospora homoclinella, Didymellopsis latitans*, *Epibryon solorinae, Hobsoniopsis santessonii, Lasiosphaeriopsis salisburyi, Lecanora baicalensis, Lichenochora coppinsii, L. elegantis, Lichenoconium xanthoriae, Lichenostigma elongatum, Lobaria epovae, Muellerella atricola, Opegrapha geographicola, O. pulvinata, Phaeoseptoria peltigerae, Phoma denigricans, P. peltigerae, P. physciicola, Polycoccum crassum, Polydesmia lichenis, Psora elenkinii, Reconditella physconiarum, Rhymbocarpus geographici, Roselliniella pannariae, Sclerococcum montagnei, Scutula dedicata, S. epiblastematica, Skyttea tephromelarum, Stigmidium squamariae, Tremella christiansenii, Trichosphaeria lichenum, Unguiculariopsis thallophila, Weddellomyces protearius, Xenonectriella lutescens, Zwackhiomyces immersae*, and *Z. physciicola*. **New to the American Arctic:** *Arthonia glebosa ,Caloplaca epithallina, Polycoccum bryonthae, Psorula rufonigra, Scutula tuberculosa, Stigmidium solorinarium, S. tabacinae***,** and *Unguiculariopsis refractiva*. **New to Arctic Alaska:** *Agonimia tristicula, Gowardia arctica, "Lecidea" diapensiae, Phaeospora parasitica, Phylliscum demangeonii,* and *Pronectria robergei*. **New to the Canadian Arctic:** *Illosporium carneum, Placidiopsis pseudocinerea*, and *Stigmidium peltideae*. **New to Greenland:** *Taeniolella diederichiana*. **New to Svalbard:** *Graphium aphthosae, Llimoniella groenlandiae*, and *Polycoccum bryonthae*. **New to the Russian Arctic:** *Caloplaca tominii, Cercidospora xanthoriae, Glypholecia scabra, Lecanora argentea, L. cavicola, Neolamya peltigerae, Phaeospora peltigericola, Polycoccum pulvinatum, Psora vallesiaca, Rhagadostoma brevisporum, Rimularia insularis, Squamarina lentigera, Stigmidium mitchellii, Tetramelas phaeophysciae*, *Xenonectriella ornamentata,* and *Zwackhiomyces coepulonus*.

Many finds are also new to the other subdivisions of the Holarctic. Among the better geographically studied lichens these are as follows. **Alaska:** *Caloplaca celata, Psora luridella, Psorula rufonigra,* and *Seirophora*

contortuplicata. **Beringian Alaska:** *Rhizocarpon umbilicatum.* **Lapponia Murmanica Province of Murmansk Region of Russia:** *Euopsis pulvinata, Lecanora leptacina,* and *L. orae-frigidae.* **Franz Josef Land:** *Caloplaca psoricida, Cladonia cornuta* ssp. *cornuta, Dactylina ramulosa, Pannaria hookeri, Peltigera lyngei, Psoroma tenue* var. *boreale,* and *Stereocaulon arenarium.* **Nenetz Region of Russia:** *Diplotomma nivale.* **Polar Ural:** *Agonimia tristicula, Biatora subduplex, Bryodina rhypariza, Lecanora leptacinella, Parmeliella triptophylla,* and *Phylliscum demangeonii.* **Asian Russia:** *Opegrapha pulvinata.* **Yamal-Gydan Region of Russia:** *Cladonia cornuta* ssp. *groenlandica, C. decorticata, Cystocoleus ebeneus, Lecanora leptacinella, Protothelenella leucothelia,* and *Thelocarpon epibolum.* **South Siberia:** *Lecanora luteovernalis.* **Sayan Mts.:** *Cetraria rassadinae* and *Pertusaria saximontana.* **Western Sayan Mts.:** *Anaptychia bryorum.* **Severnaya Zemlya:** *Lecidea alpestris.* **Taimyr Pen.:** *Caloplaca approximata, Flavocetraria minuscula, Gowardia arctica, Phylliscum demangeonii, Pilophorus cereolus, Pleopsidium chlorophanum, Solorina bispora* var. *subspongiosa, Stereocaulon intermedium, S. symphycheilum, Thelocarpon impressellum,* and *Xanthoparmelia pulla.* **Putorana Plateau:** *Lecanora leptacinella.* **Central Siberia:** *Lecidea umbonata.* **Yakutiya:** *Biatorella contigua, Lecanora luteovernalis,* "*Lecidea*" *diapensiae,* and *Lobaria epovae.* **Arctic Yakutiya:** *Caloplaca xanthostigmoidea, Dermatocarpon rivulorum, Gypsoplaca macrophylla, Lecanora crustacea, Peltigera elisabethae, Rhexophiale rhexoblephara, Solorina bispora* var. *subspongiosa,* and *Thelocarpon epibolum.* **Anabar–Olenek Region of Russia:** *Cetraria kamczatica* and *C. odontella.* **Wrangel' Is.**: *Psoroma tenue* var. *boreale.* **Chukotka** (excluding Wrangel' Is.)**:** *Agonimia tristicula, Caloplaca epithallina, C. xanthostigmoidea, Fuscopannaria viridescens, Gowardia arctica, Lecanora luteovernalis, Massalongia carnosa,* and *Rhizocarpon umbilicatum.* **Magadan Region of Russia:** *Psorinia conglomerata.* **North-East of Russia:** *Psora elenkinii.*

Twenty species of lichenicolous fungi/lichens are for the first time reported on the following host genera: *Arthonia epiphyscia* on *Rinodina, Arthrorhaphis olivacea* on *Parmeliopsis, Carbonea vitellinaria* on *Tephromela, Cercidospora punctillata* on *Lecanora, Corticifraga peltigerae* on *Pseudocyphellaria, Dactylospora deminuta* on *Caloplaca, Fuscopannaria, Lecidoma*, and *Solorina*, *Didymellopsis latitans* on *Biatorella, Lichenoconium lecanorae* on *Ramalina, Merismatium decolorans* on *Peltigera, Merismatium heterophractum* on *Rinodina, Merismatium nigritellum* on *Solorina, Muellerella lichenicola* on *Phaeorrhiza, Opegrapha pulvinata* on *Placidium, Phaeosporobolus alpinus* on *Anaptychia*, *Physia*, and *Physconia, Phaeosporobolus usneae* on *Alectoria, Phoma physciicola* on *Anaptychia, Stigmidium mitchellii* on *Psoroma, Stigmidium psorae* on *Psorula* (the first verified record), *Thelocarpon impressellum* on *Solorina,* and *Xenonectriella lutescens* on *Fuscopannaria.*

Thirty five species of lichenicolous fungi/lichens are first documented on the following host species: *Adelococcus alpestris* on *Acarospora putoranica, Arthonia fuscopurpurea* on *Peltigera occidentalis, Arthonia peltigerina* on *Peltigera continentalis, P. elisabethae,* and *P. occidentalis, Buellia lecanoricola* on *Lecanora hagenii, Carbonea supersparsa* on *Lecanora geophila, Cercidospora punctillata* on *Psoroma tenue, Chaenothecopsis parasitaster* on *Cladonia pleurota, Corticifraga fuckelii* on *Peltigera occidentalis, Dacampia rufescentis* on *Peltigera lepidophora, Dactylospora deminuta* on *Lecanora geophila, Dactylospora homoclinella* on *Lecanora argentea, Endococcus rugulosus* on *Rhizocarpon sorediosum, Graphium aphthosae* on *Peltigera venosa, Illosporium carneum* on *Peltigera aphthosa, Lichenoconium lecanorae* on *Evernia perfragilis, Lecanora baicalensis* and *L. crustacea, Lichenostigma elongatum* on *Lobothallia melanaspis, Merismatium heterophractum* on *Lecanora epibryon, Muellerella lichenicola* on *Rinodina roscida, Odontotrema cuculare* on *Parmeliopsis ambigua, Phoma peltigerae* on *Peltigera leucophlebia* and *P. scabrosa, Phoma physciicola* on *Physcia caesia, Polycoccum crassum* on *Peltigera didactyla, Pronectria walkerorum* on *Ochrolechia frigida, Rhagadostoma lichenicola* on *Solorina bispora, Scutula dedicata* on *Peltigera lepidophora, Skyttea lecanorae* on *Lecanora epibryon, Stigmidium croceae* on *Solorina saccata, Stigmidium peltideae* on *Peltigera continentalis, Stigmidium pumilum* on *Physia albinea, Stigmidium pseudopeltideae* on *Peltigera degenii* and *P. elisabethae, Tremella christiansenii* on *Physcia dubia, Trichosphaeria lichenum* on *Peltigera aphthosa, P. leucophlebia, P. malacea, and P. scabrosa, Unguiculariopsis thallophila* on *Lecanora hagenii, Xenonectriella lutescens* on *Solorina spongiosa*, and *Xenonectriella ornamentata* on *Peltigera rufescens.*

Abundance of lichenicolous fungi/lichens is rarely documented. Among the 147 species (860 examined specimens) of these organisms, only the following 25 species were represented by 10 or more finds: *Dactylospora deminuta* s. l. (64 finds), *Stigmidium peltideae* s. l. (39), *Muellerella erratica* (36), *Cercidospora punctillata* (31), *Tetramelas pulverulentus* (28), *Arthonia peltigerina* (27), *Corticifraga peltigerae* (27), *Stigmidium solorinarium* (22), *Phaeosporobolus usneae* (21), *Pyrenidium actinellum* (20), *Stigmidium mitchellii* (18), *Trichosphaeria lichenum* (17), *Thelocarpon epibolum* f. *longisporum* (16), *Scutula tuberculosa* (15), *Illosporium carneum* (13), *Lichenoconium lecanorae* (13), *Niesslia peltigericola* (13), *Stigmidium pseudopeltideae* (13), *S. pumilum* (13), *Diplotomma nivale* (12), *Graphium aphthosae* (12), *Endococcus perpusillus* s. l. (11), *Cercidospora epipolytropa*

(10), *Corticifraga fuckelii* (10), *Muellerella pygmaea* (10), *M. ventosicola* (10), *Polycoccum bryonthae* (10), and *Pronectria robergei* s. l. (10).

Acknowledgements

I am indebted to Gary Laursen, Eva Pfeiffer and Dmitry Bol'shiyanov for the opportunity to perform field studies at Alaska, Severnaya Zemlya, and Taimyr Peninsula. I am also grateful to the many lichen collectors, who donated their undetermined gatherings for my study. These are first of all Irina Makarova, Nadezhda Matveeva, Donald Walker, Sergei Kholod, and Adrian Katenin. Many finds were also obtained from collections of the late Anna Dombrovskaya, Tamara Dudoreva, Olga Lavrinenko, Vladimir Shevchenko, the late Vladimir Kuvaev, the late Vsevolod Savicz, Lev Biazrov, the late Ludmila Bredkina, Yulia Cherkasova, Aleksei Dobrysh, M. Emers, G. Frost, Alexandr Galanin, Maria Gavrilo, Vladimir Golubkov, William Gould, G. Grosse, the late Evgeniya Khodachek, Natalia Koroleva, the late Yurii Kozhevnikov, the late Valentina Perfil'eva, Taimi Piin, Tamara Polozova, Tat'yana Pystina, J. Roth, Vadim Shtrik, the late Alexandr Titov, Irina Urbanavichene, Nikolai Vekhov, Risto Virtanen, the late Boris Yurtsev, and Lidiya Zanokha. Thanks are due to Paul Diederich, Hannes Hertel, Trevor Goward, Curtis Bjork, Tat'yana Makryi, Vera Malysheva, Vadim Mel'nik, the late Josef Poelt, Christian Printzen, Ulrik Søchting, Andreas Beck, Einar Timdal and Dagmar Tribel for revision of some critical materials, valuable discussion and/or technical help during the study. Karen Dillman kindly checked the English. The field work of the author in Sayan Mts. in 2009 was supported by the Russian Foundation for Basic Research grant 07-04-00364. Partial support of the collections from High Arctic Canada and Alaska and the Kolyma River in Russia came from the U.S. National Science Foundation (Grant No. OPP-012076), and collections in the Yamal Peninsula, Russia were supported by the U.S. National Aeronautics and Space Administration (Grant No. NASA NNG6GE00A). This study is partly supported by the Basic Research Program of the Presidium of RAS "Biodiversity". Thanks also to Paul Diederich and Dag Øvstedal for reviewing the manuscript.

Literature Cited

Ahti, T. 1980. Taxonomic revision of *Cladonia gracilis* and its allies. Annales Botanici Fennici, 17: 195-243.

Ahti, T., G.W. Scotter and H. Vänskä. 1973. Lichens of the Reindeer Preserve, Northwest Territories, Canada. The Bryologist, 76: 48-76.

Alstrup, V. 2004. New records in distribution of lichens and lichenicolous fungi. Graphis Scripta, 16(2): 46-57.

Alstrup, V. and D.L. Hawksworth. 1990. The lichenicolous fungi of Greenland. Meddelelser om Grønland, Bioscience, 31: 1-90.

Alstrup, V., E.S. Hansen and F.J.A. Daniels. 2000. Lichenized, lichenicolous and other fungi from North and North-East Greenland. Folia Cryptogamica Estonica, 37: 1-20.

Alstrup, V., M. Grube, J. Motiejūnaitė, A. Nordin and M. Zhurbenko. 2008. Lichenicolous fungi from the Skibotn area, Troms, Norway. Graphis Scripta, 20: 1-8.

Alstrup, V., J. Kocourkova, M. Kukwa, J. Motiejūnaitė, W. v. Brackel and A. Suija. 2009. The lichens and lichenicolous fungi of South Greenland. Folia Cryptogamica Estonica, 46: 1-24.

Andreev M.P. 1998. *Lecidea*. *In:* Handbook of the lichens of Russia, Issue 7. Publishing House "Nauka", St. Petersburg, pp. 6-97.

Andreev, M.P. 2008a. *Psorinia*. *In:* Handbook of the lichens of Russia, Issue 10. Publishing House "Nauka", St. Petersburg, pp. 82-85.

Andreev, M.P. 2008b. *Rimularia*. *In:* Handbook of the lichens of Russia, Issue 10. Publishing House "Nauka", St. Petersburg, pp. 13-30.

Boqueras, M. 2000. Líquens Epífits i Fongs Liquenícoles del Sud de Catalunya: Flora i Comunitats [The Epiphytic Lichens and Lichenicolous Fungi of South Catalonia: Flora and Communities]. Institut d'Estudis Catalans, Barcelona. 556 p.

Brodo, I.M., D. Sharnoff and S. Sharnoff. 2001. Lichens of North America. Yale University Press, New Haven & London. 795 p.

Calatayud, V. and P. Navarro-Rosinés. 1998. *Weddellomyces xanthoparmeliae* sp. nov. and additions to the chorology of other species of the genus. Mycotaxon, 69: 503-514.

Christiansen, M.S. 1956. A new species of the form-genus *Lichenoconium* Petr. & Syd. (Fungi Imperfecti), *L. xanthoriae* sp. n. Friesia, 5(3-5): 212-217.

Colour Identification Chart. Flora of British Fungi. 1969. Her Majesty's Stationery Office, Royal Botanical Garden Edinburgh

Diederich, P. and J. Etayo. 2000. A synopsis of the genera *Skyttea*, *Llimoniella* and *Rhymbocarpus* (lichenicolous Ascomycota, Leotiales). The Lichenologist, 32: 423-485.

Diederich, P, M. Zhurbenko and J. Etayo 2002. The lichenicolous species of *Odontotrema* (syn. *Lethariicola*) (Ascomycota, Ostropales). The Lichenologist, 34: 479-501.

Diederich, P., D. Ertz and J. Etayo. 2010. An enlarged concept of *Llimoniella* (lichenicolous Helotiales), with a revised key to the species and notes on related genera. The Lichenologist, 42 (in press).

Elvebakk, A. and H. Hertel. 1997. A catalogue of Svalbard lichens. *In:* Elvebakk, A. and P. Prestrud (eds.): A Catalogue of Svalbard Plants, Fungi, Algae, and Cyanobacteria. Norsk Polarinstitutt Skrifter, pp. 271-359.

Ertz, D. and J.M. Egea. 2007. *Opegrapha*. *In:* T.H. Nash III, C. Gries and F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 3. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 255-266.

Etayo, J. and O. Breuss. 1996. Líquenes y hongos liquenícolas de los Pirineos occidentales y norte de la Península Ibérica, IV. Cryptogamie, Bryologie-Lichénologie, 17(3): 213-230.

Etayo, J. and V. Calatayud. 2005. *Taeniolella diederichiana*, a new lichenicolous hyphomycete on *Placopsis*. The Lichenologist, 37: 303-305.
Etayo, J. and P. Navarro-Rosinés. 2008. Una combinación y tres especies nuevas de Lichenochora (Phyllachorales, ascomicetes liquenícolas), y notas adicionales para el género. Revista Catalana de Micologia , 30: 27-44.
Etayo, J. and L.G. Sancho. 2008. Hongos liquenicolas del Sur de Sudamerica, especialmente de Isla Navarino (Chile). Bibliotheca Lichenologica, 98: 1-302.
Fryday, A.M. 2004. A new species of *Fuscopannaria* with a green photobiont, and other taxonomic innovations and new records of lichenized-fungi from Alaska. The Bryologist, 107(2): 173-179.
Golubkova, N.S. 1981. Konspect Flory Lishainikov Mongolyskoi Narodnoi Respupliki [Synopsis of lichen flora of Mongolian People's Republic]. Biologicheskie Resursy i Prirodyne Usloviya Mongolyskoi Narodni Respubliki, Vol. 16. Publishing House "Nauka", Leningrad. 200 p.
Golubkova, N.S. 2008. *Psora*. *In:* Handbook of the lichens of Russia, Issue 10. Publishing House "Nauka", St. Petersburg, pp. 389-403.
Golubkova, N.S. and M.P. Zhurbenko. 1990. *Acarospora putoranica* Golubk. & Zhurb. – lichen e parte media Sibiriae novus [*Acarospora putoranica* Golubk. & Zhurb. – a new lichen species from Putorana Plateau (Central Siberian Tableland)]. Novosti Sistematiki Nizshikh Rastenii, [Leningrad] 27: 101-106. (in Russ.).
Grube, M. and J. Hafellner. 1990. Studien an flechtenbewohnenden Pilzen der Sammelgattung *Didymella* (Ascomycetes, Dothideales). Nova Hedwigia, 51(3-4): 283-360.
Hafellner, J. 1989. Studien uber lichenicole Pilze und Flechten VII. Uber die neue Gattung *Lichenochora* (Ascomycetes, Phyllachorales). Nova Hedwigia, 48(3-4): 357-370.
Hafellner, J. 1999. Beiträge zu einem Prodromus der lichenicolen pilze Österreichs und angrenzender Gebiete. IV. Drei neue Arten und weitere bemerkenswerte Funde hauptsächlich in der Steiermark. Linzer Biologische Beitrage, 31(1): 507-532.
Hafellner, J., S. Obermayer and W. Obermayer. 2005: Zur Diversität der Flechten und lichenicolen Pilze im Hochschwab-Massiv (Nordalpen, Steiermark) [Diversity of lichens and lichenicolous fungi in the Hochschwab-massif (Northern Alps, Styria)]. Mitteilungen der Naturwissenschaftlichen Vereines für Steiermark, 134: 57-103.
Hafellner, J., G. Herzog and H. Mayrhofer. 2008. Zur Diversität von lichenisierten und lichenicolen Pilzen in den Ennstaler Alpen (Österreich: Steiermark, Oberösterreich). Mitteilungen der Naturwissenschaftlichen Vereines für Steiermark, 137: 131-204.
Halonen, P., L. Myllys, S. Velmala and H. Hyvärinen. 2009. *Gowardia* (Parmeliaceae) – a new alectorioid lichen genus with two species. The Bryologist, 112(1):138-146.
Hawksworth, D.L. 1978. Notes on British lichenicolous fungi: II. Notes from the Royal Botanical Garden Edinburgh, 36: 181-197.
Hawksworth, D.L. 1980. Notes on some fungi occurring on *Peltigera*, with a key to accepted species. Transactions of the British Mycological Society, 74: 363-386.
Hawksworth, D.L. 1981. The lichenicolous coelomycetes. Bulletin of the British Museum (Natural History), Botany Series, 9: 1-98.
Hawksworth, D.L. and M.S. Cole. 2004. *Phoma fuliginosa* sp. nov., from *Caloplaca trachyphylla* in Nebraska, with a key to the known lichenicolous species. Lichenologist, 36(1): 7-13.
Hawksworth, D.L. and R. Santesson. 1990. A revision of the lichenicolous fungi previously referred to *Phragmonaevia*. Bibliotheca Lichenologica, 38: 121-143.
Hertel, H. 2000. Lecideaceae Exsiccatae. Fasc. 16 (no. 301-320). Arnoldia, 18: 1-28.
Index Fungorum. 2009. http://www.indexfungorum.org (accessed 29 September 2009).
Jørgensen, P.M. 2004. *Psoroma tenue* var. *boreale*, an overlooked, widespread, arctic-alpine lichen. Graphis Scripta, 15(1/2): 60-64.
Jørgensen, P.M. and M. Zhurbenko. 2002. Two new, remarkable, arctic species in the lichen genus *Fuscopannaria* (Pannariaceae, lichenized Ascomycetes). The Bryologist, 105(3): 465-469.
Karatygin, I.V., E.L. Nezdoiminogo, Yu.K. Novozhilov and M.P. Zhurbenko. 1999. Russian Arctic Fungi. Annotated checklist. Khimiko-Pharmatsevticheskaya Akademiya, St.-Petersburg. 212 p.
Kholod, S.S. and M.P. Zhurbenko. 2005. The lichens of Wrangel Island: activity and habitat distribution of the species. Botanicheskii Zhurnal [St.-Petersburg], 90: 1329-1367.
Knoph, J.-G., G. Rambold, D. Triebel and C. Kainz. 2004. *Carbonea*. *In:* T.H. Nash III, B.D. Ryan, P. Diederich, C. Gries and F. Bungartz. (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 2. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 54-55.
Kocourková, J. 2000. Lichenicolous fungi of the Czech Republic. (The first commented checklist). Acta Musei Nationalis Pragae, Series B, Historia Naturalis, 55 [1999] (3-4): 59-169.
Kopachevskaya, E.G. 1971. *Placolecanora*. *In:* Handbook of the lichens of the U.S.S.R., Issue 1. Publishing House "Nauka", Leningrad, pp. 219-238.
Kotlov, Yu.V. 1998. *Psilolechia*. *In:* Handbook of the lichens of Russia, Issue 7. Publishing House "Nauka", St. Petersburg, pp. 117-118.
Kristinsson, H., M. Zhurbenko and E.S. Hansen. 2009. Panarctic checklist of lichens and lichenicolous fungi. CAFF International Secretariat, CAFF Technical Report No. 20.

Lumbsch, H. T. and S.M. Huhndorf (eds.) 2007. Outline of Ascomycota – 2007. Myconet 13: 1-58 (http://www.fieldmuseum.org/myconet/outline.asp, accessed 5 May 2009).
Makryi, T.V. 1984. *Cetraria rassadinae* - a new lichen species from Pribaikalye. Botanicheskii Zhurnal [Leningrad], 69: 952-957.
Makryi, T.V. 1993. New species *Lobaria epovae* (Lichenes) from Pribajkalie. Botanicheskii Zhurnal [St.-Petersburg], 78: 126-131.
Makryi, T.V. 2008. Chapter 4. Lichens. *In:* Cryptogamig plants of the Pribaikalsky National Park. Academic Publishing House "Geo", Novosibirsk, pp. 113-259.
Makryi, T.V. and A.V. Lishtva. 2005. Lichens. *In:* Biota of Vitimskii Reserve: Flora. Academic Publishing House "Geo", Novosibirsk, pp. 115-175.
Navarro-Rosinés, P., V. Calatayud and J. Hafellner. 2004. *Cercidospora*. *In:* T.H. Nash III, B.D. Ryan, P. Diederich, C. Gries and F. Bungartz. (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 2. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 635-639.
Nordin, A. and L. Tibell. 2005. Additional species in *Tetramelas*. The Lichenologist, 37: 491-498.
Petersen, J.H. 1996. The Danish Mycological Society's Colour-chart. Copenhagen.
Poelt, J. 1983. Uber den Formenkreis der Flechte *Lecanora contractula*. International Journal of Mycology and Lichenology, 1: 143-160.
Puolasmaa, A., E. Pippola, S. Huhtinen, H. Hyvarinen and S. Stenroos. 2008. One lichen and eleven lichenicolous fungi new to Finland. Graphis Scripta, 20: 35-43.
Rambold, G. and D. Triebel. 1992. The Inter-lecanoralean Associations. Bibliotheca Lichenologica, 48: 1-201.
Rossman, A.Y., G.J. Samuels, C.T. Rogerson and R. Lowen. 1999. Genera of Bionectriaceae, Hypocreaceae and Nectriaceae (Hypocreales, Ascomycetes). Studies in Mycology, 42: 1-248.
Roux, C. and D. Triebel. 1994. Révision des espèces de Stigmidium et de Sphaerellothecium (champignons lichénicoles non lichénisés, Ascomycetes) correspondant à Pharcidia epicymatia sensu Keissler ou à Stigmidium schaereri auct. Bulletin de la Société Linéenne de Provence, 45: 451-542.
Saccardo, P.A. 1891. Sylloge fungorum omnium hucusque cognitorum. IX. Patavii, Typis Seminarii. 1141 pp.
Santesson, R. 1993. The Lichens and Lichenicolous Fungi of Sweden and Norway. SBT-förlaget, Lund. 240 p.
Santesson, R., R. Moberg, A. Nordin, T. Tønsberg and O. Vitikainen. 2004. Lichen-forming and lichenicolous fungi of Fennoscandia. Museum of Evolution, Uppsala University. 359 p.
Sedelnikova, N.V. 1990. Lichens of Altai and Kuzneck Upland. Flora Synopsis. Siberian Branch of Academy of Sciences of USSR, Central Siberian Botanical Garden, Novosibirsk. 174 p.
Søchting, U., V. Alstrup, J. Kocourková, J. Vondrák and R.S. Larsen. 2007. Additions to the lichen and lichenicolous flora of Denmark VII. Graphis Scripta 19(2): 40-47.
Stearn, W.T. 1992. Botanical Latin. 4th. edn. David & Charles Publishers, Newton Abbot, Devon, UK.
Thomson, J.W. 1984. American Arctic Lichens 1. The Macrolichens. Columbia University Press, New York. 504 p.
Thomson, J.W. 1997. American Arctic Lichens. 2. The Microlichens. The University of Wisconsin Press, Madison. 675 p.
Tibell, L. and G. Thor. 2003. Calicioid lichens and fungi of Japan. Journal of the Hattori Botanical Laboratory, 94: 205-259.
Timdal, E. 1986. A revision of *Psora* (Lecideaceae) in North America. The Bryologist, 89: 253-275.
Timdal, E. 1991. *Anamylopsora*, a new genus in the Lecideaceae. Mycotaxon, 42: 249-254.
Titov, A.N. 2006. Mycocalicioid fungi (the order Mycocaliciales) of Holarctic. KMK Scientific Press, Moscow. 296 p.
Triebel, D. 1989. Lecideicole Ascomyceten. Eine Revision der obligat lichenicolen Ascomyceten auf lecideoiden Flechten. Bibliotheca Lichenologica, No. 35. J. Cramer, Berlin-Stuttgart. 278 pp.
Triebel, D., G. Rambold and J.A. Elix. 1995. A conspectus of the genus *Phacopsis* (Lecanorales). The Bryologist, 98(1): 71-83.
Triebel, D., M. Wedin and G. Rambold. 1997. The genus *Scutula* (lichenicolous ascomycetes, Lecanorales): species on the *Peltigera canina* and *P. horizontalis* groups. Acta Universitatis Upsaliensis, Symbolae Botanicae Upsaliensis 32(1): 323-337.
Türk, R. and F. Berger. 1999. Neue und seltene Flechten sowie lichenicole Pilze aus den Ostalpen III. Linzer Biologische Beitrage, 31(2): 929-953.
Urbanavichus, G., T. Ahti T and I. Urbanavichene. 2008. Catalogue of Lichens and Allied Fungi of Murmansk Region, Russia. Norrlinia, 17: 1-80.
Vitikainen, O. 1994. Taxonomic revision of *Peltigera* (lichenized Ascomycotina) in Europe. Acta Botanica Fennica, 152: 1-96.
Vitikainen, O. and T. Dudoreva. 2003. *Arctoparmelia subcentrifuga* new to Europe. Graphis Scripta, 14: 3-4.
Vouaux, L. 1914. Synopsis des Champignons, parasites de Lichens. Bulletin de la Société mycologique de France, 30(2): 135-198.
Zhurbenko, M.P. 1992. The new and rare species of lichens from the north-western part of the Putorana plateau. Botanicheskii Zhurnal [St.-Petersburg], 77: 108-114.
Zhurbenko, M.P. 1996. Lichens and lichenicolous fungi of the northern Krasnoyarsk Territory, Central Siberia. Mycotaxon, 58: 185-232.
Zhurbenko, M.P. 1999. Lichenes partis polaris montium Uralensium in valle fl. Sob [Lichens of the Sob River valley, Polar Ural]. Novosti Sistematiki Nizshikh Rastenii [St. Petersburg], 33: 120-130.
Zhurbenko, M.P. 2000. Lishainiki i likhenofil'nye griby Putoranskogo zapovednika [Lichens and lichenicolous fungi of the Putorana Reserve]. Flora i fauna zapovednikov [Flora and fauna of reserves], Moscow, 89: 1-55.

Zhurbenko, M.P. 2001. Lichenicolous fungi from Murmansk region of Russia. Mikologiya Fitopatologiya [St. Petersburg], 35(1): 34-40.
Zhurbenko, M.P. 2002. Lichenicolous fungi from the Polar Ural. Mikologiya Fitopatologiya [St. Petersburg], 36(6): 9-14.
Zhurbenko, M.P. 2003. New and rare lichen species (Lichenes) from Sakha-Yakutiya Republic and Magadan Region. Botanicheskii Zhurnal [St.-Petersburg], 88: 111-118.
Zhurbenko, M.P. 2004. Lichenicolous and some interesting lichenized fungi from the Northern Ural, Komi Republic of Russia. Herzogia, 17: 77-86.
Zhurbenko, M. 2007a. *Corticifraga santessonii* and *C. chugachiana* (Lecanoromycetes, Ascomycota), new species of lichenicolous fungi from the Holarctic. The Lichenologist, 39: 221–226.
Zhurbenko, M. P. 2007b. The lichenicolous fungi of Russia: geographical overview and a first checklist. Mycologia Balcanica, 4: 105-124.
Zhurbenko, M.P. 2008. Lichenicolous fungi from Russia, mainly from its Arctic. II. Mycologia Balcanica, 5(1-2): 13-22.
Zhurbenko, M.P. 2009a. Lichenicolous fungi and some lichens from the Holarctic. Opuscula Philolichenum, 6: 87-120.
Zhurbenko, M.P. 2009b. New and interesting lichenicolous hypocrealean fungi from the Northern Hemisphere. Sydowia, 61(1): 177–188.
Zhurbenko, M. and T. Ahti. 2005. Contribution to the study of the lichen genera *Cladina* and *Cladonia* in the Russian Arctic, mainly from Taimyr Peninsula and Severnaya Zemlya. Nova Hedwigia, 81(1-2): 79-95.
Zhurbenko, M. and F.J.A. Daniëls. 2003. New or rarely reported lichenicolous fungi and lichens from the Canadian Arctic. Mycotaxon, 88: 97-106.
Zhurbenko, M.P. and E.A. Davydov. 2000. Lichenicolous fungi and some lichens from the Russian Altai, southern Siberia. Folia Cryptogamica Estonica, 37: 109-118.
Zhurbenko, M.P. and J. Hafellner. 1999. Lichenicolous fungi from the Putorana plateau, Siberian Subarctic. Folia Cryptogamica Estonica, 34: 71-79.
Zhurbenko, M.P. and E.S. Hansen. 1993. *Lecanora geophila* and *Arctopeltis thuleana* (Lichenes) from the Siberian Arctic. Botanicheskii Zhurnal [St.-Petersburg], 78: 125-127.
Zhurbenko, M.P. and D.E. Himelbrant. 2002. Lichenicolous fungi from the Kandalaksha Gulf, Karelia Keretina, Russia. Folia Cryptogamica Estonica, 39: 51-59.
Zhurbenko, M. and G. Laursen. 2003. Lichenicolous fungi from Central Alaska: new records and range extensions. The Bryologist, 106(3): 460-464.
Zhurbenko, M. P. and T. Lumbsch. 2006. *Pertusaria christae* is a synonym of *P. saximontana*. The Lichenologist, 38: 487-490.
Zhurbenko, M.P. and N.V. Matveeva. 2006. Terricolous lichens of the Bol'shevik Island (Severnaya Zemlya archipelago). Botanicheskii Zhurnal [St.-Petersburg], 91: 1457-1484.
Zhurbenko, M. P. and R. Santesson. 1996. Lichenicolous fungi from the Russian Arctic. Herzogia, 12: 147-161.
Zhurbenko, M.P., G.A. Laursen and D.A. Walker. 2005. New and rare lichenicolous fungi and lichens from the North American Arctic. Mycotaxon, 92: 201-212.

Opuscula Philolichenum, **7**: 187-190. 2009.

A new saxicolous species of *Porina* (Ostropales; Porinaceae) from the Falkland Islands

Patrick M. McCarthy[1] & Alan M. Fryday[2]

ABSTRACT. – The new saxicolous species, *Porina austroatlantica*, is described from the Falkland Islands in the South Atlantic Ocean.

Introduction

Between 1965 and 1973 Henry Imshaug collected lichens extensively in the austral regions of the Southern Hemisphere, visiting Islas Juan Fernández (1965), the Falkland Islands (1968), Patagonia (1969, 1971), Campbell Island (1969–70), Îles Kerguelen (1971), Tierra del Fuego (1971) and the Auckland Islands (1972–73). These collections are housed in the herbarium of Michigan State University (MSC) (Fryday & Prather 2001).

The Falkland Islands (Islas Malvinas) were visited by Imshaug and his then graduate student Richard Harris, who spent six weeks on the islands and made nearly 3,000 lichen collections, by far the largest lichen collection ever made there. Although all of the specimens were assigned Imshaug collecting numbers, Imshaug's field books, which are also in MSC, indicate which collections were made by Imshaug and which by Harris. Most of this material was accessioned into MSC, and several new species identified and given *in sched.* names, but the only publication that Imshaug produced was a short, narrative report on the expedition (Imshaug 1969). More recently, however, a number of taxonomic innovations and new records for the Falkland Islands have been reported from these collections (Calvelo & Fryday 2006, Coppins & Fryday 2006, Fryday 2002, Fryday 2005, Fryday & Common 2001, Messuti & Archer 1999, Stenroos & Ahti 1992).

Whereas *Porina s. lat.* is diverse and often luxuriant in the tropics, it is far less prominent in temperate regions, and even rarer closer to the poles. Only five species have been reported from south of latitude 50°S: *P. chlorotica* (Ach.) Müll. Arg. (King George Island in the South Shetland group and Macquarie Island), *P. guentheri* (Flot.) Zahlbr. (Macquarie Island and the Auckland Islands), *P. kantvilasii* P.M. McCarthy (Campbell Island), *P. leptalea* (Durieu & Mont.) A.L. Sm. (Macquarie Island) and *P. oleriana* (A. Massal.) Lettau (Tierra del Fuego) (see McCarthy 2009 for further details). Here we report a new species of *Porina* from the Falkland Islands [51–52°S, 57.7–61.4°W], which, although known from only two collections, is highly distinctive within the genus.

Materials and Methods

Hand sections were examined in water and in 10% KOH; asci were also examined in Congo Red. Measurements of algae, thalline hyphae, paraphyses, ascospores and conidia were made at ×1000 magnification, those of entire asci were made at ×400 magnification. Perithecial and ascospore dimensions are presented as mean values with extreme values in parentheses. Total numbers of perithecia, asci and ascospores measured are in square brackets.

[1] Patrick M. McCarthy — Australian Biological Resources Study, G.P.O. Box 787, Canberra, A.C.T. 2601, Australia. – e–mail: Patrick.McCarthy@environment.gov.au
[2] Alan M. Fryday — Herbarium, Department of Plant Biology, Michigan State University, East Lansing, MI, 48824–1312, U.S.A. – e–mail: fryday@edu.msu

The New Species

Porina austroatlantica **P.M. McCarthy & Fryday sp. nov.**
MycoBank #515577.

Thallus epilithicus, interne rimosus vel areolatus, albidus vel pallidoviridis, 30–50–(60) µm crassus, cortice paraplectenchymatico. Perithecia plerumque convexa vel hemisphaerica, (0.25)–0.33–(0.46) mm diametro. Involucrellum 50–70 µm crassum, extra nigrofuscum vel nigrum, intra comparate pallidum. Centrum 0.18–0.26 mm diametro. Asci 120–138 × 7–9 µm. Ascosporae 3-septatae, (19)–22.0–(27) × (4)–4.8–(6) µm. Conidia 2–3–(3.5) × 0.5–0.7 µm.

TYPE: **FALKLAND ISLANDS**: East Falkland, Stanley, Mullet Creek, stream below fiord, UTM Grid 21F VC 3270, alt. 100–150 ft [*c.* 30–45 m, on quartzitic rock], 30.i.1968, *H.A. Imshaug 41472 & R.C. Harris* [collected by Harris] (MSC, holotype).

Description. – *Thallus* crustose, epilithic, *c.* 1–2 cm wide, effuse, determinate or partly eroded, continuous towards the margin, rimose to sparingly areolate towards the center, off-white to pale greenish, smooth to rugulose or verruculose (largely determined by the microtopography of the substratum), 30–50–(60) µm thick, lacking a dark basal layer, corticate, K–, calcium oxalate crystals absent. *Cortex* hyaline, paraplectenchymatous, 10–15–(20) µm thick; cells tightly packed, angular to rounded, 3–5–(6) µm wide. *Photobiont Trentepohlia*; cells broadly ellipsoid to globose, 8–16 × 7–12 µm. *Interstitial hyphae* moniliform to long-celled, 2–4–(6) µm thick. *Prothallus* a thin, discontinuous brownish black line, or not apparent. *Ascomata* perithecia, numerous, solitary or in short rows or small clusters, partly immersed in thalline verrucae, convex to hemispherical, often appearing superficial where the surrounding thallus has been eroded, (0.25)–0.33–(0.46) mm diam. [50], outwardly dull to glossy brownish black or black at the apex or in the upper half, or almost completely dark; often the lower parts distinctly thalline; apex rounded or distorted; ostiole inconspicuous or in a shallow c. 30–50 µm wide depression. *Involucrellum* ± apical or extending more than half-way to excipulum-base level, 50–70 µm thick, outer layers dark olive-brown to blackish brown in thin section, reddish brown or orange-brown internally, the colours darkening and intensifying in K; ostiolar region occasionally with a bluish tint that is K+ grey. *Centrum* subglobose to depressed-obovate, 0.18–0.26 mm wide. *Excipulum* c. 20–25 µm thick at the base and sides of the centrum, predominantly hyaline from base to apex, the outer layers pale to medium orange-brown or greenish brown, K+ pinkish red. *Subhymenium* 25–35 µm deep. *Paraphyses* unbranched, 0.8–1.2 µm thick. *Periphyses* absent. *Asci* 8-spored, with a rounded or subtruncate apex and a indistinct, apical chitinoid ring that darkens in Congo Red, 120–138 × 7–9 µm [14]. *Ascospores* oblong to fusiform, mostly straight, usually with pointed ends, overlapping-uniseriate or slightly oblique in the ascus, hyaline, 3-septate, (19)–22.0–(27) × (4)–4.8–(6) µm [75]; perispore very thin or not apparent; contents usually clear. *Conidiomata* pycnidial, moderately numerous, semi-immersed to almost completely immersed in the thallus, 0.1–0.15 mm diam., plane to convex and dark greenish brown above, hyaline below, with a simple to richly convoluted conidiogenous layer. *Conidia* simple, elongate-ellipsoid to fusiform or bacilliform, 2–3–(3.5) × 0.5–0.7 µm.

Etymology. – The epithet "austroatlantica" alludes to the type locality, the Falkland Islands in the South Atlantic Ocean.

Distribution. – This species is known from only two collections: the type locality on the east coast of East Falkland Island, where it grows on coastal quartzitic rock, and from granitic rock at 900 ft (275 m) on western West Falkland.

Discussion. – *Porina austroatlantica* is characterised by the thin and very pale thallus lacking calcium oxalate crystals, prominent perithecia with a variably developed involucrellum that is blackish externally but reddish brown within, a rather thick excipulum, elongate narrowly cylindrical asci, small 3-septate ascospores and minute conidia. In addition to the illustrations provided here (Plate 1), habit and anatomical photographs of the type specimen are also available (Fryday 2009).

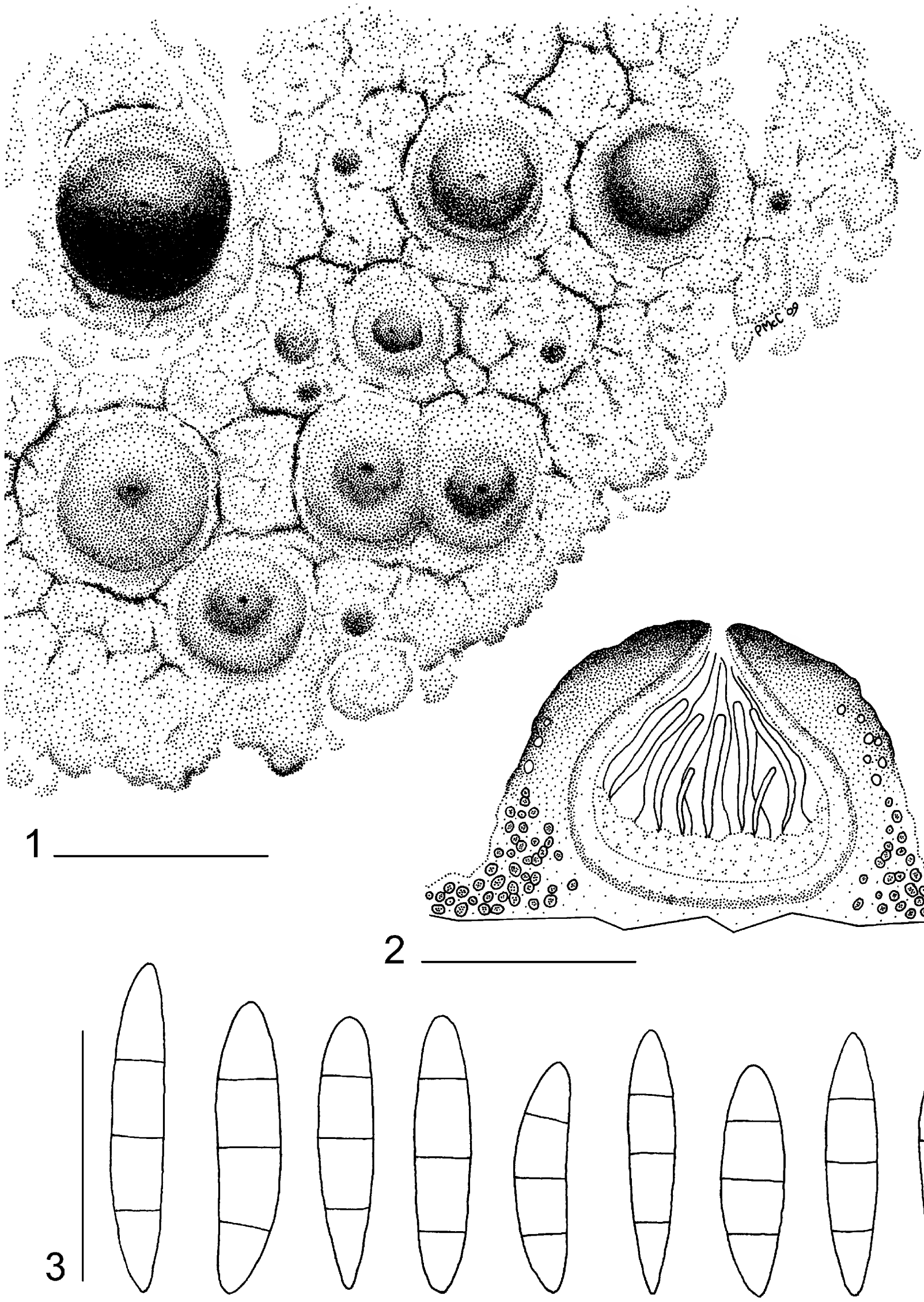


Plate 1. *Porina austroatlantica* (holotype). Figure 1, habit of thallus, perithecia and conidiomata (scale bar = 0.5 mm). Figure 2, sectioned perithecium and adjacent thallus (semi-schematic; scale bar = 0.2 mm). Figure 3, ascospores (scale bar = 20 µm).

Although the characters listed above are diagnostic for the new species, comparison with other saxicolous *Porina* species with 3-septate ascospores from tropical and subtropical South America is useful (see McCarthy 1993, 2000, 2009). *Porina melanops* Malme, confirmed from southern Brazil, has a pale brown thallus containing crystals of calcium oxalate and considerably larger algae, and although the perithecia are similar to those of *P. austroatlantica* in appearance and anatomy, the ascospores are 19–35 × 3–4.5 µm. *Porina nigrofusca* Müll. Arg., from southern Brazil and tropical Australia, has an exceptionally thick, K+ red-brown thallus, perithecia without thalline elements, and conidia 3–5–(7) µm long. Finally, *P. sphaeralis* Malme, from Paraguay, is a particularly distinctive lichen, having subglobose perithecia that are markedly attenuated at the base, a greatly reduced involucrellum, algal cells that are incorporated into the perithecial wall almost to the apex, and shorter and broader asci. Other saxicolous species with 3-septate ascospores and broadly similar perithecial structure, e.g. *P. weberi* P.M. McCarthy from Chile (perithecia 0.4–1.5 mm diam.), the palaeotropical *P. ulceratula* Zahlbr. (K– involucrellum; asci 97–110 × 12–15 µm) and the palaeotemperate *P. corrugata* Müll. Arg. (perithecia 0.4–1.5 mm diam.), have even less potential for confusion with *P. austroatlantica*.

Additional specimen examined. – **FALKLAND ISLANDS**: West Falkland, Hill Cove, ridge of N slope of Mt Fagen, UTM 21F TC 7289, alt. 900 ft [275 m], outcrops and Polsterboden [granitic rock], 26.i. 1968, *H.A. Imshaug 41177 & R.C. Harris* [collected by Imshaug] (MSC).

Acknowledgements

We thank the U.S, National Science Foundation (NSF) for Awards No. DBI–9808735 and DBI–0237401 (Alan Prather, PI) to Michigan State University which facilitated access to Dr. Imshaug's extensive collections.

Literature Cited

Calvelo, S. and A.M. Fryday. 2006. New reports of lichenized fungi from Tierra del Fuego, and the Falkland Islands (Islas Malvinas). The Bryologist, 109(3): 372–380.

Coppins, B.J. and A.M. Fryday. 2006. New or previously misunderstood species of *Lithographa* and *Rimularia* (*Agyriaceae*) from the southern subpolar region and western Canada. The Lichenologist, 38(2): 93–107.

Fryday, A.M. 2002. New combinations and records of lichenized-fungi from southern South America. Mycotaxon, 82: 421–428.

Fryday, A.M. 2005. *Nimisia deusta*, the correct name for *N. fuegiae*, with additional notes on morphology, distribution, and chemical composition. The Lichenologist, 37(4): 313–319.

Fryday, A.M. 2009. Lichens of the Southern Subpolar Region. Michigan State University, East Lansing. (http://www.herbarium.msu.edu/SSP/SSP_Taxa.html).

Fryday, A.M. and R.S. Common. 2001. A new species of *Schaereria* (lichenized-fungi) from the Falkland Islands. The Bryologist, 104(1): 109–114.

Fryday, A.M. and L.A. Prather. 2001. The lichen collection of Henry Imshaug at Michigan State University Herbarium (MSC). The Bryologist, 104(3): 464–467.

Imshaug, H.A. 1969. Expedition to Falkland Islands, 1968. Antarctic Journal of the United States, 4: 247–248.

McCarthy, P.M. 1993. Saxicolous species of *Porina* Müll.Arg. (Trichotheliaceae) in the Southern Hemisphere. Bibliotheca Lichenologica, 52: 1–134.

McCarthy, P.M. 2000. Key to the saxicolous taxa of *Porina*. The Lichenologist, 32(1): 1–13.

McCarthy, P.M. 2009. Catalogue of Porinaceae. Australian Biological Resources Study, Canberra. Version 13 August 2009. (http://www.anbg.gov.au/abrs/lichenlist/PORINACEAE.html).

Messuti, M.I. and A.W. Archer. 1999. The lichen genus *Pertusaria* in the Falkland Islands (Islas Malvinas). The Bryologist, 102(2): 208–214.

Stenroos, S. and T. Ahti. 1992. The lichen family Cladoniaceae in the Falkland Islands. Annales Botanici Fennici, 29: 67–73.

Opuscula Philolichenum, **7**: 191-194. 2009.

Further notes on the genus *Ramonia* in California: the first modern record of *R. ablephora* and the description of *R. extensa* sp. nov.

James C. Lendemer[1], Kerry Knudsen[2] & Brian J. Coppins[3]

ABSTRACT. – Further notes on the *Ramonia gyalectiformis*-group are presented. The first collection of *R. ablephora* since 1903 is reported and its ecology discussed. And a new species, *R. extensa*, is described from serpentine outcrops in Lake County, California. The new species differs from *R. gyalectiformis* in having smaller apothecia and longer ascospores.

Introduction

Presently three species of the crustose lichen genus *Ramonia* are known to occur in the arid mountain ranges of southern California in western North America. These three taxa (*R. ablephora* (Nyl.) R.C. Harris, *R. gyalectiformis* (Zahlbr.) Vězda, and *R. vermispora* Lendemer & K. Knudsen) form a group of morphologically similar species that are united by their unusual ecologies (saxicolous or terricolous) and dark cabonized exciples. They differ from each other only in the size of the apothecia and the size and shape of the ascospores. *Ramonia ablephora* and *R. gyalectiformis* were first collected by H.E. Hasse in the early 20th century and due to a lack of adequate material were considered synonyms until a modern collection of *R. gyalectiformis* lead to a reappraisal of their taxonomic status (Knudsen & Lendemer 2005).

While collecting in the San Jacinto Mountains, the same mountain range where we relocated *Ramonia gyalectiformis*, we collected material of a third species which we named *R. vermispora* on the basis of its vermiform ascospores (Lendemer & Knudsen 2008). At that time we hypothesized all three species were restricted to different habitats and physiographic provinces, with *R. ablephora* occurring on coastal soil in the Santa Monica Mountains, *R. gyalectiformis* occurring on decomposing granite in the chaparral belt of the San Jacinto Mountains, and *R. vermispora* occurring on granite in montane habitats of the San Jacinto Mountains. In the year that has elapsed since the description of *R. vermispora*, we have further explored the diverse habitats of the San Jacinto Mountains and located an extant population of *R. ablephora*. Concurrently we have come across material of an additional undescribed member of the *R. gyalectiformis* group among specimens annotated by Antonin Vězda at the herbarium of the Royal Botanical Garden at Edinburgh. This new species, here described as *R. extensa*, extends the geographic range of the *R. gyalectiformis* group to northern California (Lake County) and extends the ecological range occupied by members of the group to include serpentine.

[1] James C. Lendemer — Institute of Systematic Botany, The New York Botanical Garden, Bronx, N.Y. 10458-5126, U.S.A. – e-mail: jlendemer@nybg.org

[2] Kerry Knudsen — Herbarium, Department of Botany and Plant Sciences, University of California Riverside, C.A. 92521, U.S.A. – e-mail: kk999@msn.com

[3] Brian J. Coppins — Herbarium, Royal Botanic Garden Edinburgh, Edinburgh, EH3 5LR, Scotland, U.K.

Materials and Methods

Specimens were studied dry using a Baush & Lomb StereoZoom 7 dissecting microscope. Microscopic characters were measured in water with an Olympus BX51 compound microscope and images were captured using an Olympus DP20 digital camera with Microsuite Special Edition. Illustrations were prepared using Adobe Photoshop. Sections of the thallus and apothecia were prepared by hand cutting with a razor blade and mounted in water. Measurements are based on water mounts prior to the application of 10% KOH. Chromatography was not performed on the specimens because standard spot reagents did not produce any positive reactions and no lichen substances have previously been reported from the *Ramonia gyalectiformis* group. Furthermore, in the case of the type of *R. extensa* there is very little material.

I – The New Report of Ramonia Ablephora

Until now *Ramonia ablephora* was only known from historical collections made by H.E. Hasse on soil in the Santa Monica Mountains in the late 1890's and early 1900's. We believed that this species occupied coastal habitats that have now largely been degraded or destroyed (Lendemer & Knudsen 2008) but could not confirm this because we had never observed it in the field. In 2008, we discovered a population of *R. ablephora* in the Rouse Ridge area of the San Jacinto Mountains, an area well known for its carbonate derived soils where we have collected many calciphiles. This discovery supports our original hypothesis and provides valuable new information about the ecology of *R. ablephora*.

The newly discovered population occurred on an undisturbed knife-edged ridge where some granite was intermixed with calcareous rock, forming a weakly calcareous soil which was HCl-. A reexamination of the type specimen from the Santa Monica Mountains revealed that it was also on a weakly calcareous soil that was HCl-.

Besides its probable restriction to a calcareous or weakly calcareous substrate, further information about the ecology *Ramonia ablephora* was gained from a lichen associated with the newly discovered population. On Rouse Ridge *R. ablephora* was growing with another coastal terricolous lichen endemic to western North America (southern California and Oregon), *Psora pacifica* Timdal (Timdal 2002). This taxon was reported from the Channel Islands and mainland California near the coast below 440 meters. Our discovery of *P. pacifica* in the San Jacinto Mountains at 821 meters elevation is the most inland location known. The occurrence of these typically coastal species so far inland on Rouse Ridge can be explained by the fact that the site is on the coastal side of the San Jacinto Mountains and has a mild climate where oranges and grapefruits are still grown on its terraces. The area has intrusions of a marine layer during part of the year bringing fog and moisture almost 80 km (approximately 50 miles) inland from the coast. The occurrence of these two species together suggests Rouse Ridge is a disjunct site for normally coastal species at a higher elevation than they would now normally occur in southern California.

Specimen Examined. – **U.S.A. CALIFORNIA**. RIVERSIDE CO.: Peninsular Range, San Bernardino National Forest, San Jacinto Mountains, Rouse Ridge, Blackburn Canyon Quad., elev. 821 m, coastal sage scrub with disintegrating carbonates and granite, on carbonate derived soil, 5.x.2008, *J.C. Lendemer 14747 & K. Knudsen* (NY!).

II – Description of Ramonia Extensa

***Ramonia (subg. Ramonia) extensa* Lendemer, K. Knudsen and Coppins sp. nov.**
Mycobank #514026.

Similis *R. gyalectiformi* sed ascosporis 25-30 x 4.5-5 µm et apotheciis 0.3-0.4 mm latis.

TYPE: **U.S.A. CALIFORNIA**. LAKE CO.: Complexion Springs, [ca. 480 m], 20.ii.1972, on serpentine rock, *L. Sigal s.n.* (E!, holotype).

Description. – Thallus crustose, epilithic, ecorticate and chalky-white. Photobiont *Trentepohlia*. Apothecia 0.3-0.4 mm in diameter, confluent in the material examined, at first immersed becoming erumpent, disc pale black-brown to grey, margin radially fissured. Exciple black, carbonized, 30-40(-50)

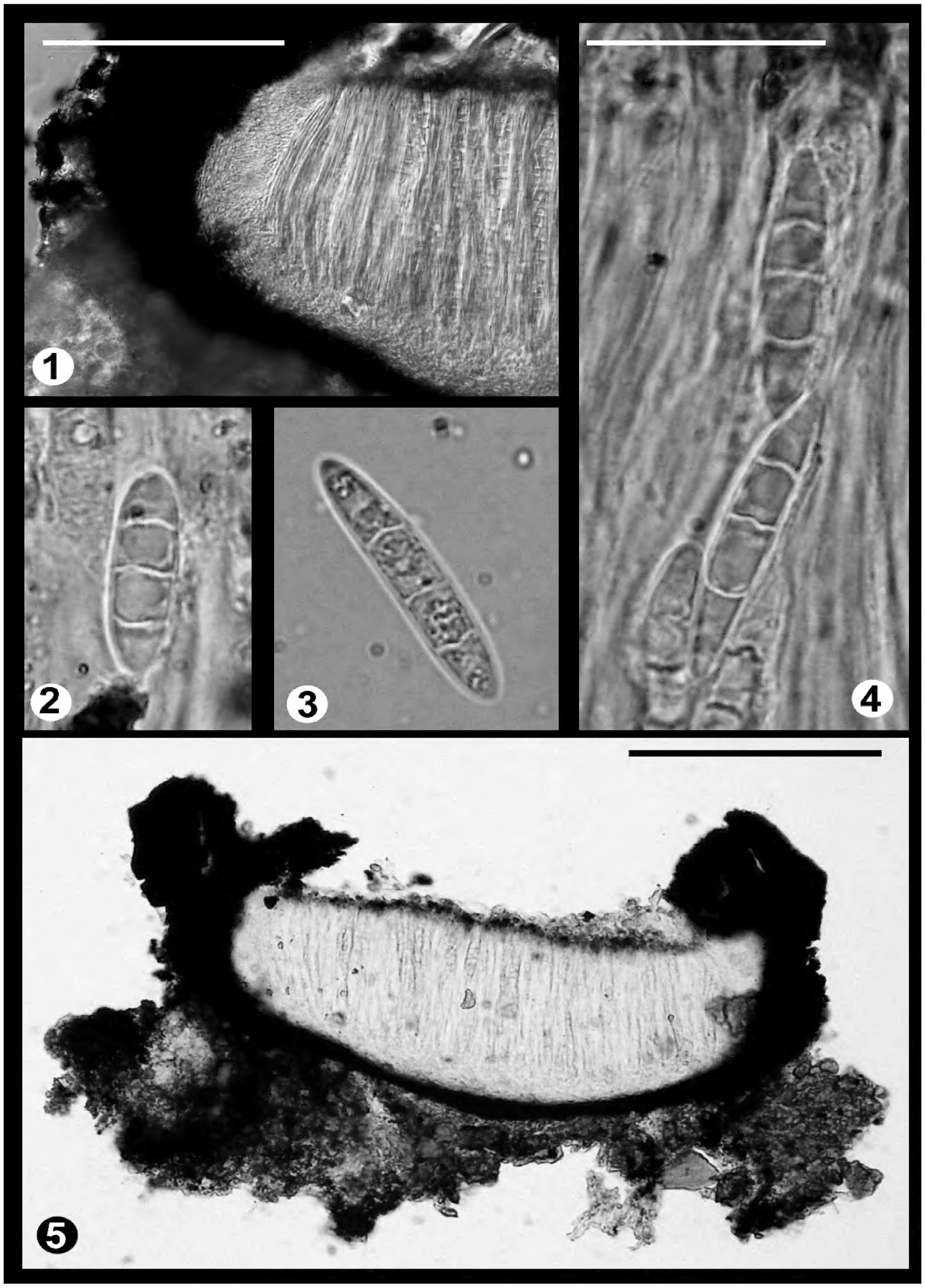


Plate 1. *Ramonia extensa* (all from holotype). Figure 1, periphyses (scale =100µm). Figures 2-4, ascospores (scale = 20µm). Figure 5, section of apothecium (200µm).

µm wide, thinner at the base of the hymenium, only the inner-most layer of cells distinct (i.e. not carbonized, dark brown, ~3-5 µm wide), inner surface lined with a thick pad of periphyses (50-60 µm wide). Hymenium 150-170 µm tall, hyaline, K-. Asci cylindrical, 80-100 x 15-20 µm, 8-spored. Ascospores clavate-fusiform, transversely 3-5-septate, hyaline, 25-31 x 4.5-5 µm. Periphyses ~2-2.5 µm wide, with the uppermost cell slightly expanded. Hypothecium hyaline, 15-20 µm thick.

ETYMOLOGY. – The epithet "extensa" refers to the extended nature of the ascospores, which resemble those of *R. gyalectiformis* except stretched.

ECOLOGY AND DISTRIBUTION. – The new species occurs on serpentine rock and is known only from the type locality in northern California.

DISCUSSION. – The apothecial morphology (e.g. carbonized exciple) and saxicolous habit clearly allies *Ramonia extensa* to the *R. gyalectiformis*-group which is itself anomalous in the genus *Ramonia* (Lendemer & Knudsen 2008). In the size of the apothecia and ascospores the species is closest to *R. gyalectiformis*, differing essentially in having smaller apothecia (0.3-0.4 mm vs. 0.5-0.7 mm diameter) and longer, narrower ascospores (25-31 x 4.5-5 µm vs. 17-25 5-6 µm). The discovery of this species on serpentine rocks in Lake County in northern California significantly extends the distribution of the *R. gyalectiformis* group.

III – KEY TO THE RAMONIA GYALECTIFORMIS GROUP

As the key to *Ramonia* we included with the description of *R. vermispora* is now incomplete we provide below a revised key to the species known from California, which collectively form the *R. gyalectiformis*-group.

1. Ascospores acicular/vermiform.....*R. vermispora*
1. Ascospores fusiform or obovate.....2

2. Ascospores obovate, 7-8 µm wide; on weakly calcareous soils.....*R. ablephora*
2. Ascospores fusiform, 4-6 µm wide; on granite or serpentine.....3

3. Ascospores 17-25 µm long; on granite and decomposed granite.....*R. gyalectiformis*
3. Ascospores 25-31 µm long; on serpeninte.....*R. extensa*

ACKNOWLEDGEMENTS

We thank Bruce McCune and Göran Thor for reviewing the manuscript. Thanks also to Richard Harris for help with the illustrations.

LITERATURE CITED

Knudsen, K. and J.C. Lendemer. 2005. Changes and additions to the checklist of North American lichens — III. Mycotaxon, 93: 277-281.

Lendemer, J.C. and K. Knudsen. 2008. *Ramonia vermispora*, a new species from the Sonoran Desert region of southwestern North America. Opuscula Philolichenum, 5: 83-88.

Timdal, E. 2002. *Psora. In:* Nash III, T.H., B.D. Ryan, C. Gries, and F. Bungartz (eds.): Lichen Flora of the Greater Sonoran Desert Region, Vol. 1. Lichens Unlimited, Arizona State University, Tempe, Arizona, pp. 418-430.

NEW TAXA (INCL. MYCOBANK NOS.)

Arthonia rubrocincta [MB#514027]……9

Carnegieispora [MB#515391]……17

Carnegieispora rimeliae [MB#515392]……17

Cladonia stipitata [MB#515515]……95

Corticifraga fusispora [MB#515562]……127

Cryptothecia evergladensis [MB#515450]……52

Lecanora gyrophorica [MB#515360]……22

Lecanora munzii [MB#515361]……24

Lichenodiplis rinodinicola [MB#515362]……29

Odontotrema japewiae [MB#515563]……142

Opegrapha pulvinata var. placidiicola [MB#515564]……144

Porina austroatlantica [MB#515577]……188

Ramonia extensa [MB#514026]……192

Syncesia subintegra [MB#515406]……58

Verrucaria thujae [MB#515301]……13